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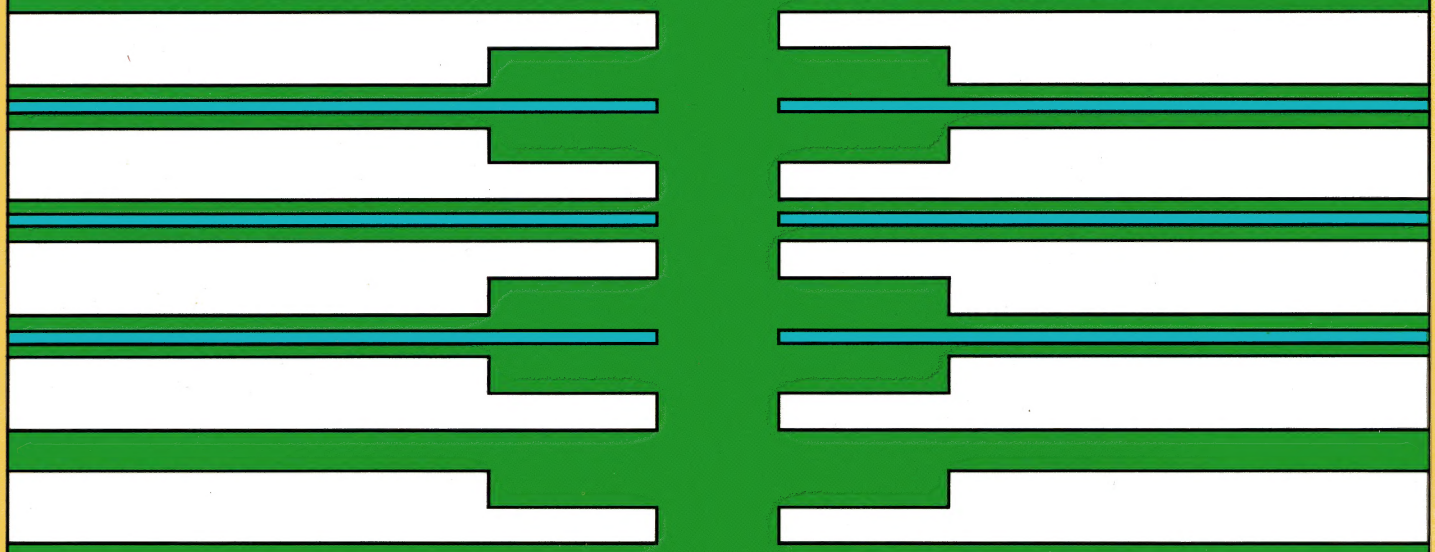
MASTERING MULTIPLAN™

BY THE COMPUTER SCHOOL



MASTERING
MULTIPLAN™

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BY THE COMPUTER SCHOOL:
DAVID BOLOCAN, SAECHIN KIM,
RAY KING & LAUREN SINGER

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Introduction

Not knowing anything about computers these days is close to not being able to operate a telephone. There are millions of people firmly entrenched in the computer industry and millions more who are beginning to dig in. If you fall into either of these categories, then this book is for you. If you have very little experience with computers, this book starts you from the very beginning, turning on the power and inserting a disk into the correct drive. If you are an expert, this book will quickly and painlessly show you how to use the awesome power of *Multiplan*.

This book does what no computer manual has done for *Multiplan* before. It presents material in a clear and concise manner for the less than expert computer user. Important options that you will frequently use are covered in the early chapters of the book. More complicated commands that you may never use are saved until the end.

The commands follow in a logical manner so you need only read Chapters 3, 4, and 5 to learn how to arrange your own spreadsheets. Commands presented after Chapter 5 are designed to add aesthetic appeal to your spreadsheet and to make it easier for you to manipulate very large work sheets. Chapter 2 is designed for those who are not familiar with the Disk Operating System (DOS). It may be omitted by the more experienced reader. Chapter 3 shows how to install *Multiplan* for IBM PC or IBM PC-compatible machine, a task the *Multiplan* manual does not cover.

Computers are very useful for two main things, data management and information analysis. *Multiplan* has been designed to help you store and analyze data for your own needs. It is an electronic spreadsheet. A spreadsheet enables you to organize data coherently. On the spreadsheet, numbers are arranged in rows and columns. A checkbook is an example of a spreadsheet.

Various calculations can be performed on the data. You may need to find the sum of a column of numbers, the average of a row of numbers, or the minimum and maximum values in a group of numbers called entries. If a paper spreadsheet is used, such information must be recalculated whenever new entries are made.

A Checkbook is a Familiar Spreadsheet.

Number	Date	Dep/Cred	Payment	Daily Bal	Description
	08/01/83	$500.00		$500.00	Paycheck
1101	08/02/83		$75.34	$424.66	Phone
1102	08/02/83		$192.36	$232.30	Am Ex
				$232.30	
				$232.30	
				$232.30	
				Balance	
	Total	$500.00	$267.70	$232.30	

An electronic spreadsheet updates the figures whenever new data is entered. The computer automatically determines the effect of the changes. Moreover, you may use a single computer spreadsheet for many similar applications. The same spreadsheet that calculates a company's payroll for January can be used to calculate the payroll for February, March, and April as well. These features make the electronic spreadsheet far superior than the pencil-and-paper spreadsheet.

With *Multiplan* you can construct tables to keep track of stocks, handle accounting, or build time sheets. *Multiplan* is faster, neater, and more accurate than the pencil-and-paper technique.

Multiplan is a third-generation spreadsheet program. Its popular predecessor, Visicalc, had many limitations that made it difficult to manipulate large amounts of data on the work sheet. *Multiplan* is easy to use and fun to learn.

Chapter 1

Loading the Disk Operating System

Before you begin, it is important to remember to treat all your floppy disks with tender loving care. Disks should never be left outside of their envelopes, nor should they be exposed to ski slopes, ovens, orange juice, or strong magnets. Also, the disk surface (mud brown or dark gray) should never be touched. If you treat your disks with respect, they will provide you with accurate information storage and retrieval. Remember that extremely important information, such as your company records, could be on your disks.

If you are familiar with disk operations, you may prefer to bypass this section and go straight to Chapter 2.

LOADING THE DISK OPERATING SYSTEM

Now that you have been forewarned, open up the disk drive door of the A disk drive, which is the top drive or the drive on the left, depending upon your machine. Insert the disk containing the Disk Operating System (DOS) inside the disk drive, making sure the label is face up and the oval slot goes in first. (See Fig. 1-1.)

Apple users should load the Disk Operating System by first inserting the Apple system disk into disk drive 1. Close the disk drive door, then turn on the power to the unit. The drive will spin for a short while. When it has stopped, you will be in Apple DOS. Apple users may skip the rest of this chapter.

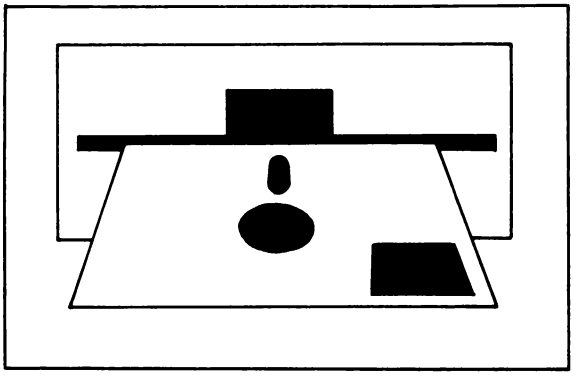


Fig. 1-1. A floppy disk being placed in a disk drive.

Turn on the computer and close the disk drive door. In a short time the computer will have checked its internal parts. Then the disk drives will activate. There is a small red light at the front of each disk drive. The red light will turn on when the disk drive is in motion. It is best not to remove disks or place disks inside the disk drive while the red light is on. If you do, important information on the disk may be damaged.

ENTERING THE DATE

After the disk drives stop, the computer will ask you for the current date and current time. You should see the following on the screen:

Current date is Tue 1-01-1980
Enter new date:

There will be a flashing bar at the end of the last line. This bar is called the cursor. A cursor comes in many shapes and forms. The cursor indicates your present position on the computer screen. If you type in a character on the keyboard, the character will appear where the cursor is right now.

Enter the date where the computer has indicated on the screen (it is always a good idea to watch the screen since the computer will constantly be telling you important information). The date should be entered by typing the month, day, and year—in that order. The day of the week (such as Monday) should *not* be entered. Separate the month, day, and year by dashes, so that the date is in the format MM-DD-YY. Then press the return key. The return key is where a carriage return is on an electronic typewriter; on the IBM the key is marked as a bent left arrow and is between the standard keyboard and the number pad to the right. For example, if today were January 17, 1984, you would enter the following.

01-17-84

If you have typed the date incorrectly the computer will respond with:

Invalid date
Enter new date:

There is no need to panic. The computer is politely asking you to reenter the date. People accustomed to typewriters often use a lowercase "L" instead of a "1" or an uppercase "O" instead of a "0" (zero). Since the computer is unable to deduce from the context whether you mean a letter or a number, it will be confused by such interchanges. Be careful not to substitute letters for numbers. If you did make an error, try again until you succeed.

ENTERING THE TIME

Next the computer inquires about the time; the following will appear on the screen (the actual digits will be different):

Current date is Tue 1-01-1983
Enter new date: 11-05-83

Current time is 0:03:15.78
Enter new time:

The display is telling you the amount of time that has elapsed since you turned the computer on. You should change the time to the current time. This will enable you to record the exact time files were modified.

You may have noticed that there appears to be no way to differentiate between A.M. and P.M. hours. To solve this problem, the computer records the time using a 24-hour clock. (Remember, the first 12 hours, from one o'clock in the morning to 12 noon are the hours one through 12. Starting at one o'clock in the afternoon, the hours are 13 through 24.) When marking the time, the hours and minutes must be set; further precision is optional. As demonstrated on the screen the hours and minutes should be separated by a colon. After you type the time, press the return key. If you have done it correctly, you will see "A>" the DOS prompt, which indicates that the computer is ready to receive further information.

Current date is Tue 1-01-1980
Enter new date: 11-05-83

Current time is 0:03:15.78
Enter new time: 18:15

The IBM Personal Computer DOS
Version 1.10 (C) Copyright IBM
Corp 1981, 1982

A>

Although this may have seemed complicated the first time, and you may have felt perplexed, don't worry. When you begin using *Multiplan* and other programs on a regular basis, loading a disk will all become a habit.

Chapter 2
Installing *Multiplan* on the IBM PC and Compatible Computers

When you buy the package off the shelf, *Multiplan* is not set up for the IBM computer. If we place the original product disk in the disk drive and try to run it, we will get useless garbage. The first thing we must do is "install" or set up *Multiplan* for the IBM PC.

> Apple users: The *Multiplan* disks sold for Apple computers are already installed for the Apple computer. Apple users may bypass this section.

RUNNING THE INSTALL PROGRAM

After DOS is loaded into the computer and you see the "A>," insert the Installation Disk in drive A (the labels on the two *Multiplan* disks indicate which is the system disk and which is the installation disk). Then type *Install* and press the return key. If you get an error message, try again. Once you read the opening messages you will see this at the bottom of the screen:

Press RETURN after each of your answers.
Press control-C at any time to abort install.

Press any key to continue.

If at any time you change your mind and decide not to install your disk, just hold down the control key, (marked "CTRL") and press the "C" key. For example, if you make an error in the installing process, you will need to end install by typing CTRL-C and then start again.

Now, press the return key. The disk drives will spin for a short while and then the program will request a change to the product disk.

File not found: MP.COM
Insert product disk in current drive,
Press any key when ready.

In response to this request, remove the installation disk, insert the *Multiplan* system disk in the va-

Table 2-1. A Printout of the Screen from the Install Program. (Each Option Contains Specific Modifications for the Corresponding Computer.)

```
Press RETURN after each of your answers.
Press control-C, at any time
to abort install.

Press any key to continue.
(Opening Installation files)

File not found: MP.COM
Insert product disk in current drive,
Press any key when ready
Data is available for these terminals:

1.  (define your own terminal)
2.  MS-DOS 2.x ANSI device driver
3.  Zenith Data Systems Z-100
4.  Texas Instruments Pegasus
5.  Compaq Computer
6.  Heath/Zenith 19
7.  Digital VT100 (ANSI mode)
(more)

Enter number corresponding to system.
Just press RETURN to see more items.
```

cated disk drive, and press the space bar.

Next you will see a list of computers on the screen (Table 2-1). You will now introduce your copy of *Multiplan* to your particular computer. Although the IBM PC is not mentioned anywhere on the list, you may adapt *Multiplan* to the specifications of the Compaq computer, which is on the list. The Compaq computer is an IBM compatible computer whose specifications are nearly identical to the IBM. At the bottom of the screen you will see the message shown below:

Enter number corresponding to system.

Just press RETURN to see more items.

The number 5 is next to the choice Compaq on the screen. Therefore, to select the Compaq specifications, type 5 and press the return key. If this does not work, try typing the backspace/rubout key until the cursor is in the leftmost column or unable to move further left, then type 5 and hit return.

Again, you should see a message in the lower left-hand corner of the screen.

File not found: INSTALL.DAT
Insert install disk in current drive,
Press any key when ready

Replace the disk in the disk drive (the *Multiplan* system disk with the Installation disk). Now press any key and wait a few seconds until the drive stops.

There is one final request on the bottom of the screen.

File not found: MP.COM
Insert product disk in current drive,
Press any key when ready

Remove the Installation disk from disk drive A and insert the *Multiplan* system disk into drive A. Press the space bar and then sit back (the lights on the disk drive should go on).

Provided you followed directions, you should soon see these lines at the bottom of the screen:

(Writing to Product)
Install complete

Insert DOS disk in drive A
and strike any key when ready

If so, congratulations! You are now ready to use *Multiplan*.

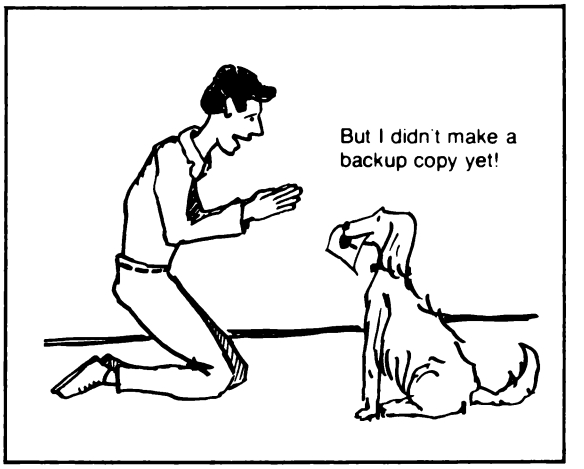


Fig. 2-1. Although disks are rarely damaged or lost, when they are, the results can be catastrophic.

MAKING BACKUP COPIES

Making backup copies of your disks is imperative. Not having a backup for a disk is like not having a spare tire for a car. A backup copy is an identical copy of the disk that functions as an "emergency" copy. As mentioned earlier, data stored on a disk is extremely vulnerable. Should any information on your disk be accidentally destroyed, your backup copy would be used as a replacement. Making a backup copy can avert total disaster like the one shown in Fig. 2-1.

> Apple users may make backup copies with the "COPY A" program on the system disk. Explicit instructions are contained in the Apple DOS manual on pages 38-40.

First find a blank disk. You are going to copy the *Multiplan* system disk that we installed earlier onto the blank disk. Load DOS into your computer as you did in Chapter 1. When you see "A>" type *diskcopy A: B:*, to tell the computer to copy all the information from the disk in drive A to the disk in drive B. If you have only one disk drive, type *diskcopy*.

The source disk is the disk you want to copy *from*; it is the original copy. The target disk is the disk you want to copy *to*; it will become the duplicate copy.

If you have two disk drives, the computer will request that you insert the source disk in drive A and the target disk in drive B.

Insert source disk in drive A:
Insert target disk in drive B:
Strike a key when ready . . .

Place the *Multiplan* system disk in drive A and a blank disk in drive B, close the disk drive doors, and press any key. The disk drives will go into motion. When they have stopped, remove the disks and type *N* to indicate you do not want to make another copy.

If you have only one disk drive then follow the directions on the screen closely. You will first have to insert the original disk in the disk drive, then press any key. The computer will load part of the disk's contents into the computer. It will then ask you to insert the disk that you are making the duplicate copy on. Insert the blank disk and press any key. You will have to repeat this sequence more than once. The computer will make this very easy by putting the instructions on the screen. As a final friendly gesture the computer will let you know the copy has been completed.

Take the original disk and store it in a cool, dark place. From now on, you will only work with the duplicate disk. The duplicate is called a *working copy*. In case the working copy is damaged, you can always create another from the original disk.

The next step is to create a disk for data storage. *Multiplan* is a very large program. There is not much space left on the *Multiplan* disk to store the work sheets you will build. A disk that is used entirely for data storage is limited only by the amount of space on the disk.

Again, find a blank disk. Insert the DOS disk in drive A. Then type *Format* and press the return key. The computer will display these instructions:

Insert new disk for drive A:
and strike any key when ready

Remove the DOS disk from the drive and insert the blank disk in the drive; then press any key. The disk drive light will go on and the disk inside will be formatted. When the computer asks if you want to format another, type *N* and press the return key.

Formatting a disk is very important. For the computer to be able to read from the disk, the magnetic particles must be properly arranged. A popular analogy compares a disk and disk drive with a record and a record player. A record has its information arranged in grooves. Similarly, a disk has its information arranged in *tracks*. When the phonograph reads information from the record, it follows the grooves. In the same way, a disk drive *head* (like the phonograph needle) reads from the tracks on the disk. If the data were not arranged in the grooves but were scattered across the record it

Table 2-2. The *Multiplan* Spreadsheet

```
#1        1          2          3          4          5          6          7
  1
  2
  3
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R1C1                                    100% Free       Multiplan: TEMP
```

would be impossible to play the record. Likewise, if the data on the disk were randomly distributed on the disk, it would be impossible for the computer to read the data. Formatting sets up the tracks that the computer will later write data to (for storage) and read data from.

> Apple users should use the INIT command to initialize a data disk. Initializing a disk in Apple DOS and formatting a disk in CP/M are synonymous. The Apple DOS manual contains instructions on pages 13-14.

USING *MULTIPLAN*

Before you run any software program, you must load the Disk Operating System (DOS) into the computer. If you see an "A>" on the last line of the screen then you are ready to run *Multiplan*.

If you do not see the "A>", turn off the computer, load DOS into the computer, and replace the DOS disk with the *Multiplan* system disk. (You may want to refer back to Chapter 1.)

Once you see "A>" you should place the *Multiplan* disk in drive A and type *MP* (upper- or lower-case). *Multiplan* will run. *Multiplan* is a large program, so it will take a few seconds to load when you see the spreadsheet in Table 2-2 appear on the screen, proceed to Chapter 3.

Chapter 3

Building a Checkbook Spreadsheet

To begin, let's analyze the *Multiplan* display. On the screen (shown in Table 3-1), there are columns labeled from 1 through 7 and rows labeled from 1 through 20. There are really a total of 63 columns and 255 rows on the *Multiplan* spreadsheet. Due to the size and the resolution of the monitor only a tiny piece of the entire work sheet is visible.

MOVING AROUND THE SPREADSHEET

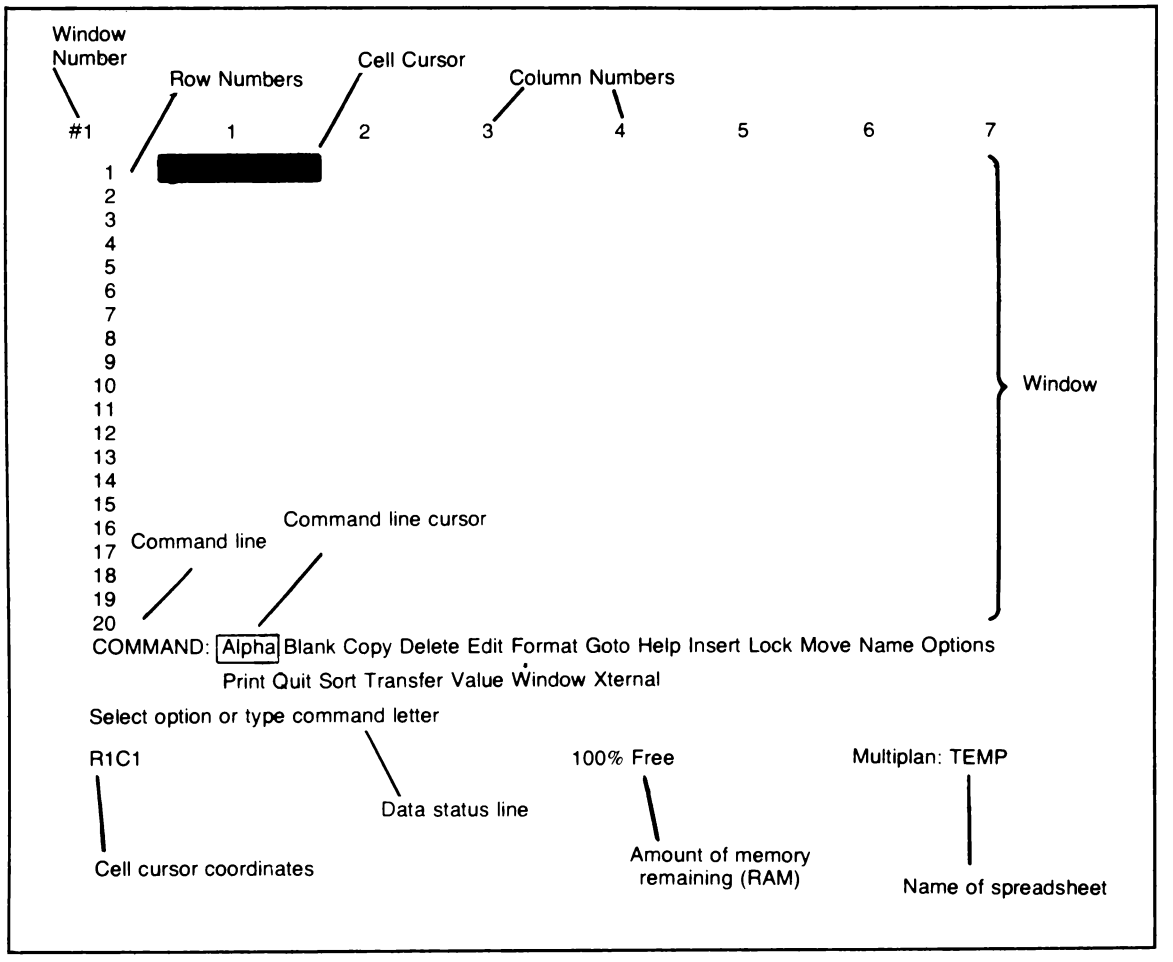
At this point there should be a large bright bar in the upper left-hand corner of the window. (Again, see Table 3-1.) The highlighted bar is referred to as the *cell cursor*. The correlation between cell cursor and cursor will soon be apparent. The cell cursor may be moved to any part of the window by using the arrow keys at the right-hand side of the keyboard (Fig. 3-1). The arrows indicate the direction the cursor will move when you press that key. Try moving to row 3 column 5 (R3C5). (If you are unable to move the cursor this way, and numbers appear on the screen, hit the NUM-LOCK key and then try moving the cursor.) Right now, try moving it to row 2 column 4 (R2C4).

As mentioned earlier, there are more columns and rows on the spreadsheet than meet the eyes of the uneducated user. At some time you may want to move the cell cursor to cell R22C3, but row 22 is not on the screen (Table 3-2). If you move the cursor down to line 20 and then hit the down arrow key twice more, the screen will scroll upward twice. Look at the lower left-hand corner of the screen (Table 3-3); it should say R22C3. This corner tells you the location of the cell cursor at all times.

You can now move the cursor to the lower limit of the *Multiplan* spreadsheet by depressing the down arrow key. The cursor will continue to head down the work sheet to higher numbered rows. By depressing the right arrow key we can see the right-hand limit of the spreadsheet as well.

Using this method consumes much time. Have no fear, there are quicker ways to move the cursor to distant locations on the spreadsheet.

Table 3-1. Parts and Terminology of the *Multiplan* Spreadsheet.



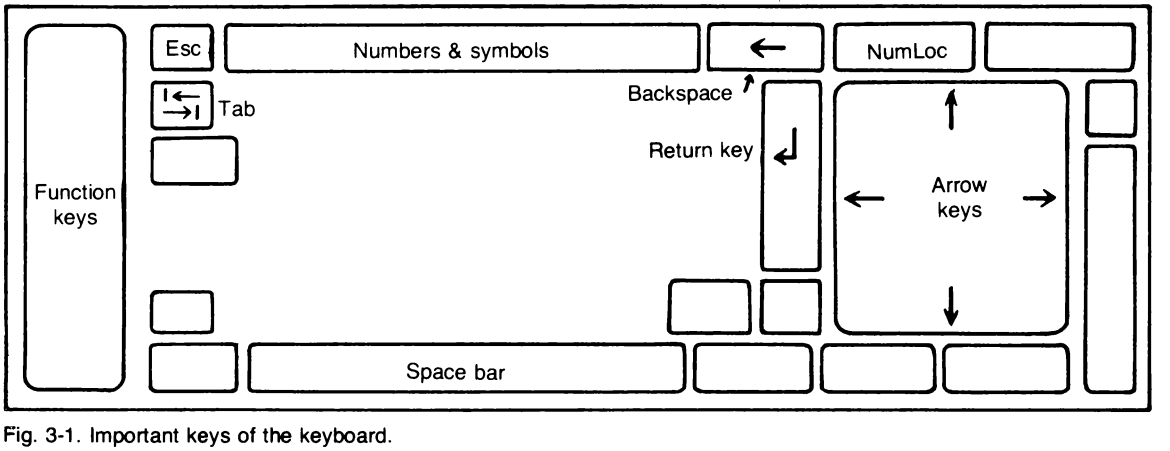


Fig. 3-1. Important keys of the keyboard.

Table 3-2. Scrolling the Screen. Notice the Bottom Row of the Spreadsheet Displayed.

```
#1        1         2         3         4         5         6         7
  1
  2
  3
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R2C4                                    100% Free       Multiplan: TEMP
```

Table 3-3. Scrolling the Screen.

```
#1        1         2         3         4         5         6         7
  3
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R22C3                                   100% Free       Multiplan: TEMP
```

The GOTO command is the key to moving the cursor more rapidly. Before studying the GOTO command, note that there is a large list of commands available in *Multiplan*. The various groups of commands are listed at the bottom of the screen.

LEARNING COMMAND SELECTION WITH THE GOTO COMMAND

There are two ways to select a command. We will enlist the user friendly method in the beginning. Tapping the space bar will highlight the next command at the bottom of the screen. Striking the backspace key will highlight the previous command. Pressing the return key will execute the highlighted command.

Suppose you want to use the GOTO command. You would tap the space bar or the backspace key until that command, GOTO is highlighted. Then press the return key.

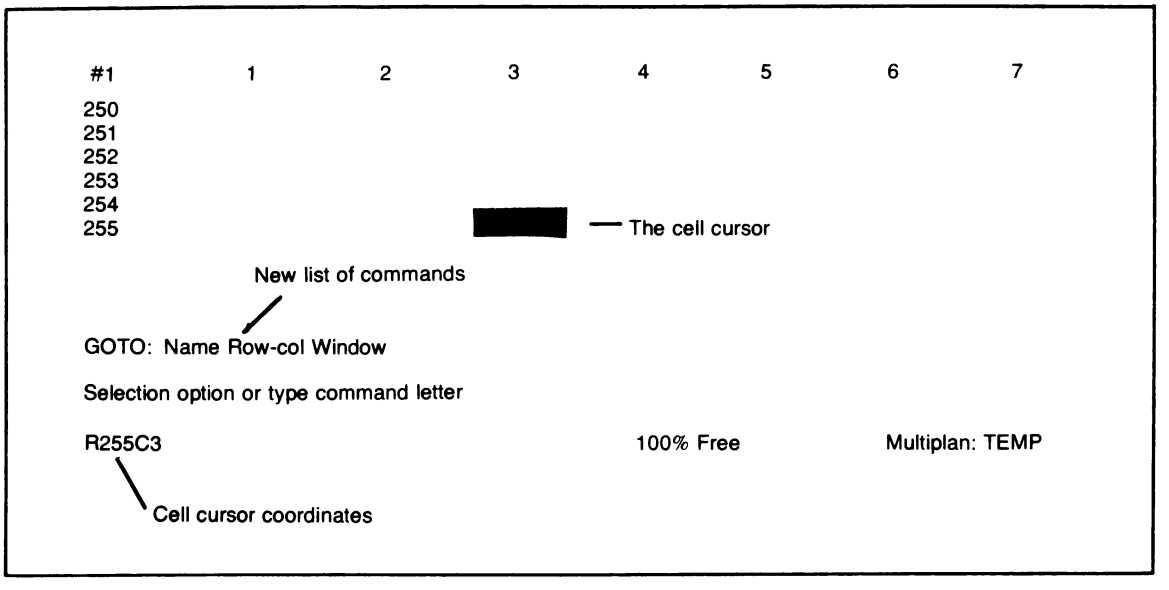
The second, faster, method involves simply typing the first letter of the desired command. If you look at the list of commands you will notice that each one starts with a different letter. The single initial letter will represent that command. For example, to select the GOTO command, you need only type the letter *G*.

If you should ever make a mistake and find yourself using the wrong command, press the escape key (labeled "ESC"), which will usually allow you to choose another command. You may think of the escape key as the panic button. It's okay to press this panic button—it will get you out of trouble.

After you have chosen the GOTO command, you will find a new list of commands in the lower-left screen, as shown in Table 3-4. *Multiplan's* commands are separated into various sublevels. You should refer to the tree diagram in Appendix A of this manual for a complete list of all the commands in *Multiplan*. Notice that the commands in the diagram have one or two sublevels. The levels may seem confusing at first, but actually the commands are arranged in a very logical fashion, which will become more apparent as you use *Multiplan*.

Now, to go to a specific cell on the *Multiplan* spreadsheet, you should pick row-col. To select the row-col option use the same techniques you used to select the GOTO command. You can type "R" for row-column, or utilize the space bar/backspace key to highlight the row-column choice and then press the return key.

Table 3-4. The Bottom Left-hand Corner of the Spreadsheet, with the GOTO Command Being Selected.



Next you should see:

GOTO Row: 1 Column: 1

The cursor (the illuminated box), will be to the immediate right of "Row". Type the desired row number. Now, to choose the column number, press the tab key to move the cursor to the column selection position. Pressing the key several times will move the cursor back and forth between the two options. Type the desired column coordinate. If you make a mistake, you may correct it by moving to that entry (with the tab key) and typing the backspace key. You may also change the coordinates by typing new coordinates over the old coordinates. When both coordinates are correct, hit the return key. The cursor will whisk over to the designated location.

The GOTO command is useful when moving over long distances. When moving across small distances on the spreadsheet it is better to use the arrow keys. For those who are inexperienced it would be a good idea to practice the GOTO commands right now. Moving the cursor is the most frequent action in designing or using a spreadsheet. The GOTO command will help you learn those unusual keys, like the tab key, that you will have to know for other commands. Therefore it is imperative that you become adept in the use of GOTO. Practice going to different coordinates for a while then move on to the next section of this book.

ENTERING LABELS AND VALUES

For our first *Multiplan* application we will construct a checkbook balance sheet. Keeping track of our money is a time-consuming process. *Multiplan* can make record keeping quick and simple.

A spreadsheet is very useful because we can store, retrieve, and analyze data with great speed. For example, suppose we design a spreadsheet in the form shown in Table 3-5.

If we wanted to review the balance on August 10, 1983, we would first look for the corresponding day under the heading date. Then we would find the balance on that row. The columns and rows of the spreadsheet organize data in an easy-to-read manner. We will begin with an elementary checkbook balance sheet. Later we will expand the sheet using more sophisticated features of *Multiplan*.

The first step in designing any spreadsheet is to place column headings or titles on the sheet. To begin with, we want to set up the titles in Table 3-6.

Our first objective is to place the word "Deposits" in at coordinates row 3 column 3 (or simply R3C3). First, we must move the cursor to R3C3 (remember, there are two alternatives). Next we have to enter the word "Deposits." We must be in the Alpha mode to type in headings. To enter the Alpha mode, type *A* (or use the space bar and back-space key to highlight ALPHA and then press the return key. Once in the ALPHA mode, *Multiplan* replies with:

ALPHA:
Enter text (no double quotes)

Table 3-5. A Neatly Formatted Spreadsheet, the Goal of All Spreadsheet Designers.

Number	Date	Dep/Cred	Payment	Description	Daily Bal
	08/01/83	$500.00		Paycheck	$500.00
1236	08/03/83		$72.34	Sprint July	$427.66
	08/04/83	$13.70		Dinner w/Dan	$441.36
1237	08/04/83		$38.92	Groceries	$402.44
1238	08/07/83		$22.73	Newsweek 1yr Subscr	$379.71
1239	08/10/83		$239.70	Am Ex June & July	$140.01
					$140.01
					$140.01
				Balance	
	Total	$513.70	$373.69	$140.01	

Table 3-6. The Checkbook Spreadsheet with the Title "Deposits" Entered.

```
#1        1          2          3          4          5          6          7
  1
  2
  3                              Deposits
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R3C3     "Deposits"                        99% Free       Multiplan: TEMP
```

Now type the word *Deposits;* then press the return key. The heading, "Deposits," should appear in location R3C3 on the worksheet.

The word is also displayed at the lower left-hand corner of the screen. This is the status line. If we have any typographical errors, we can correct them by typing the word *deposits* in R3C3, again, to replace the old, inaccurately typed "Deposits" with a new, accurately typed "Deposits." To do so, check that the cursor is in R3C3, and enter the Alpha mode again; then type the word.

As we type in the Alpha mode, the letters are exhibited on the data status line at the bottom half of the screen. If we make a mistake while typing, we can correct it by erasing with the backspace key, and typing correct letters. When the entry is perfect, hit the return key.

Next, we must place the word "Withdrawals" in location R3C4. This is done using the same sequence of steps. First, move the cursor to R3C4 and enter the Alpha mode by typing *A;* type the word *Withdrawals;* then press the return key. If you look at location R3C4 on the spreadsheet, you will see the word "Withdrawal."

The "s" has been left out (see Table 3-7). If we march the cell cursor to R3C4 and look at the data status area, the full word will be there. Words up to 150 characters may be entered into a single cell, although we can only see the first ten characters.

Multiplan normally allocates 10 spaces for any titles or numbers you write on the work sheet. In other words, we can see 10 characters across in any given column. There are ways to increase or decrease this number, but that will be covered in a later chapter. Although only 10 characters or numbers are displayed on the spreadsheet, we may view the entire contents of any cell by moving the cursor to that cell and then observing the data status line. For example, the word "Withdrawals" is displayed in its entirety there.

One last point, whenever we enter text or numbers they are displayed as we type them in at

the lower half of the screen. Only after we press the return key is the data displayed on the spreadsheet. This gives us a chance to make corrections in the text or numbers before the return key is pressed.

Now that we have the words "Deposits" and "Withdrawals" typed onto the sheet, we should enter an initial deposit. This will be, in *Multiplan* jargon, a "Value." First, we should take the cell cursor to location R5C3. There are two ways to enter numbers. The fastest and easiest way is to simply type in the number. *Multiplan* knows that any number typed in must be a "Value," so we can simply type *500* in cell R5C3 beneath the word "Deposits." This will place us in the Value mode. Once in the Value mode *Multiplan* displays:

VALUE:
Enter a formula

The alternate method would be to get into the Value code first by typing *V*; then type *500* and press the return key.

Before roaring onwards, it should be noted that it is not necessary to press the return key after we type "500." After we type "500," pressing one of the arrow keys is equivalent to pressing the return key and then the corresponding arrow key. So, if we are typing in many numbers and/or titles, it is not necessary to press the return key after each entry. We can simply move the cursor to the next location using the arrow keys on the right-hand side of the keyboard.

This technique may be used after entering either a value or a title (from the Alpha mode). After we push an arrow key instead of the return key *and* an arrow key, we are still in the Alpha/Value mode.

When in this mode, *Multiplan* assumes the next entry will either be text or a number. If the information we type from the Alpha/Value mode is led by a number or an arithmetic symbol, *Multiplan*

Table 3-7. The Spreadsheet with the Title "Withdrawals" entered.
Notice That the "S" and the End of the Word is Only Visible at the Lower Left-hand Corner of the Screen.

```
#1        1         2         3         4         5         6         7
  1
  2
  3                        Deposits  Withdrawal
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R3C4      "Withdrawals"                  99% Free       Multiplan: TEMP
```

thinks we are typing a Value. If the data typed from the Alpha/Value mode is lead by a letter, *Multiplan* thinks it is receiving a title.

To test this operation, try typing *500* in position R5C3 (Table 3-8). Before pressing the return key, move the cell cursor to the neighboring cell, R5C4, and type *125*. Again, refrain from pressing the return key. Instead, use the arrows to move the R3C6 and type the word *balance*. This process saved us from hitting the return key and then selecting either the Alpha or Value mode several times. When entering many numbers and titles, this method is very convenient.

At this point the spreadsheet should resemble the one in Table 3-9.

If it does not, it is not necessary to turn the computer off and retype everything. We have all the tools needed to replace a word or a number. If we wanted to alter "500," we would move to the cell containing "500" (in this case R5C3) and enter the correct data. (If there are any stray data on the work sheet, we will erase them later.)

ENTERING SIMPLE FORMULAS IN *MULTIPLAN*

Now that we have deposits and withdrawals, we need to determine the balance. The cursor should be at R5C6 and *Multiplan* in the command mode. When the list of commands from Alpha to eXternal appears at the bottom of the screen, we are in the command mode. The current balance is $375. However, it would not make any sense to simply type the figure 375. If we had to do this for each calculation, we might as well return to the middle ages and use a calculator. Another option is to type 500-125, but we can do even better.

In our elementary work sheet, the balance is simply the deposit minus the withdrawal. If we think about it, the balance is simply the number in R5C3 (the deposit) minus the number in R5C4 (the

Table 3-8. The Alpha/Value Mode.

```
#1        1         2         3         4         5         6         7
  1
  2
  3                        Deposits  Withdrawal
  4
  5                              500
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
ALPHA/VALUE:

Enter text or value
R5C4                                    99% Free      Multiplan: TEMP
```

Table 3-9. Current State of the Spreadsheet Under Construction.

```
#1        1          2          3          4          5          6          7
  1
  2
  3                             Deposits  Withdrawal              balance
  4
  5                                   500        125
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R3C6      "balance"                          99% Free       Multiplan: TEMP
```

withdrawal). These thoughts may be condensed to the formula R5C3-R5C4. If this formula is placed in R5C6, *Multiplan* will calculate and display the results (namely the balance) in that cell for us.

If we were to type the formula from the Alpha mode, *Multiplan* would treat the formula like a column heading or a label. All that we would see on the screen is "R5C3-R5C4". But, if we enlist the Value mode, *Multiplan* will calculate the difference and display the difference in cell R5C6.

Direct the cell cursor to cell R5C6; then type V to enter the Value mode. Now, type the formula to determine the balance, *R5C3-R5C4,* and press the return key. If everything proceeded as planned you should see the balance, as shown in Table 3-10. In a few seconds the beauty of formulas will be unveiled. If we change either the deposits or the withdrawals, the balance will be recalculated automatically.

Suppose we made an error and the initial deposit was 450. Return now location R5C3 and type 450; then press the return key. This will replace the 500 with 450. The balance will automatically change. Experiment with changing the deposit and withdrawal amounts. Notice that if the deposit is less than the withdrawal, the balance will be a negative number. Negative numbers are displayed as you would expect. Two examples are −72.34 and −500.

USING THE BLANK COMMAND

Your spreadsheet should appear as in Table 3-10. If there are any stray pieces of data on the spreadsheet, we will take care of them with the Blank command. If there are no stray marks on the spreadsheet then you've done well; however, to practice the Blank command you will have to create some errors on your spreadsheet.

Move the cursor to R12C1 and enter a title (remember the Alpha command). Type the word *Garbage*. Move down one row and type the words

More Garbage. Now we have some erasing to take care of. It is not likely that you wanted that information floating around in the middle of your checkbook.

Prepare to purge the spreadsheet of the undesirables. Check to see that the list of options is displayed at the bottom of the screen. (Remember, this set of options indicates you are in the command mode.) Then take the cell cursor to R12C1. Enter the Blank mode by typing *B* to select the Blank command. *Multiplan* will say:

Blank Cells: R12C1

Enter reference to cell or group of cells

Multiplan assumes you want to blank-out (erase) the cell where the cursor is. Move the cursor to the correct cell; Then press the return key and the space that used to hold the word "Garbage" will be cleared of the unwanted characters.

When this task has been accomplished, we can blank-out the cell containing the words "More Garbage." Send the cell cursor to the cell with the undesirable characters and eliminate them with the Blank command. If there are any other locations that should be cleared of either letters, numbers, or both, use the Blank command. If you merely want to change the contents of a cell, you may move to its position and type the desired contents.

Practice what we have done. You should be familiar with the Blank, GOTO, Alpha, and Value commands. In addition you should be adept with the arrow keys. It might be good to practice setting up some more formulas without the book. You might try entering some more deposits in rows 6 through 9 and try adding all the deposits together. Feel free to experiment.

Table 3-10. The Spreadsheet after the Entry of the Formula R5C3-R5C4.
(The Formula is Displayed in the Lower Left-hand Corner at the Data Status Line.)

```
#1        1         2         3         4         5         6         7
  1
  2
  3                        Deposits  Withdrawal          balance
  4
  5                             500        125                375
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R5C6     R5C3-R5C4                          99% Free      Multiplan: TEMP
```

USING THE QUIT COMMAND

Congratulations!! You are on your way to being a *Multiplan* ace. To take a break from a *Multiplan* session, we can do one of two things. We can leave the computer on with *Multiplan* loaded or we can quit. To do the former, we simply leave the computer alone. Since leaving your computer on for a long break can be harmful to your computer, you should quit. To do so, type *Q* to choose the Quit command. *Multiplan* will respond with:

Type Y to confirm_

If you type *Y*, we will be in DOS. If you hit any other key, we will be back in *Multiplan*. When you have quit, you may remove the disks from the disk drives and turn off the computer.

Chapter 4

Improving Your Checkbook Balance Sheet

The balance sheet established in Chapter 4 was rather simple. It only calculated the balance for one deposit and one withdrawal. Since the work sheet was unable to handle more than one deposit and one withdrawal, it would probably be outdated the day after you opened your checking account. We can, however, expand the work sheet to make it quite useful. Let's try to set up the spreadsheet in Table 4-1.

First, we must enter a list of new column headings. The Alpha command should be used to place the word *Number* in R3C1, *Date* in R3C2, *Dep/Cred* in R3C3, *Payment* in R3C4, and *Description* in R3C5. Then we must enter a series of numbers under Dep/Cred and Payment (see Table 4-2). These numbers will represent monetary transactions. At this time we do not want to enter numbers on or below row 15. Row 15 will be used to display figures representing the total deposits/credits, withdrawals, and balance. These figures will be calculated by advanced formulas.

THE SUM FUNCTION, A MODEL FUNCTION

The formula for the sum of all the deposits/credits ought to be placed in R15C3. The formula for this work sheet could be entered as R5C3+R6C3+R7C3. But this formula is static. It only calculates the sum of three deposits. Once there are more than three deposits, the formula must be modified. And the formula has to be updated whenever additional deposits are entered. Updating a formula this often is excrutiatingly tedious. There is a better way.

We may enlist one of *Multiplan's* built-in arithmetic functions, called "sum." The correct formula to add up to the deposits is "sum(R4C3:R13C3)." *Multiplan* must be in the Value mode when entering formulas. Therefore, type *V* to enter the Value mode, then type *sum(R4C3:R1C3)* at R15C3.

The formula tells *Multiplan* to add all the values in the cells between R4C3 and R13C3 inclusive.

Table 4-1. The Checkbook Spreadsheet When Completed.

```
#1        1          2          3          4          5          6          7
  1
  2
  3 Number      Date        Dep/Cred   Payment    Description           Daily Bal
  4
  5             08/01/83     $500.00              Paycheck                $500.00
  6        1236 08/03/83                 $72.34 Sprint July             $427.66
  7             08/04/83      $13.70              Dinner w/Dan            $441.36
  8        1237 08/04/83                 $38.92 Groceries               $402.44
  9        1238 08/07/83                 $22.73 Newsweek 1yr Subscr     $379.71
 10        1239 08/10/83                $239.70 Am Ex June & July       $140.01
 11
 12
 13
 14                                              Balance
 15             Total        $513.70    $373.69    $140.01
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R3C1      "Number"                          97% Free       Multiplan: b:checks
```

Table 4-2. Adding Data to the Checkbook Spreadsheet.

```
#1        1          2          3          4          5          6          7
  1
  2
  3 Number      Date        Dep/Cred   Payment    Descriptio
  4
  5                              500
  6                                       72.34
  7                             13.7
  8                                       38.92
  9                                       22.73
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
ALPHA/VALUE:
Enter text or value
R10C4                                     99% Free       Multiplan: TEMP
```

This gives us a great deal of flexibility. It provides room for ten deposits. The sum formula is also easier to build than its cumbersome counterpart, shown below.

R4C3+R5C3+R6C3+R7C3+R8C3 +R9C3+R10C3+R11C3+R12C3+R13C3

The blank cells in between R4C3 and R13C3 do not confuse *Multiplan*. *Multiplan* assumes blank cells have a value of zero.

What should the formula be for the total payment? We should use the sum function to add up all the values in cells between R4C4 and R13C4. The formula is sum (R4C4:R13C4) and should be placed within cell R15C4. To enter this formula, follow the same procedure outlined earlier. Enter the Value mode by typing *V*, then enter the formula *sum (R4C4:R13C4)*. The formulas used to calculate the total deposits and total withdrawals are almost identical. The only difference is that the formula for total Dep/Cred takes figures from column 3 and the formula for total payments takes numbers from column 4.

At this time your spreadsheet should look like the one in Table 4-3.

When this task has been completed, the balance should be placed at R15C5. The balance is the total deposits/credits minus the total withdrawals. Using the logic gained from the previous chapter, the formula is R15C3-R15C4.

Finally the check numbers, date, and descriptions must be recorded. Check numbers should be entered while in the Value mode (for sorting purposes, which will be explained later). The check descriptions should be entered from the Alpha mode. Both the check numbers and check descriptions may be entered from the Alpha/Value mode. Please enter these at your own leisure.

Entering the date poses a minor problem. The

Table 4-3. Status after the Addition of the Sum Functions.

```
#1        1          2          3          4          5          6          7
  1
  2
  3 Number     Date       Dep/Cred   Payment    Descriptio
  4
  5                            500
  6                                       72.34
  7                           13.7
  8                                       38.92
  9                                       22.73
 10
 11
 12
 13
 14
 15                         513.7      133.99
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R15C4     SUM(R4C4:R13C4)                  99% Free       Multiplan: TEMP
```

Table 4-4. Appearance after the Addition of Dates and Descriptions.

```
#1        1          2          3          4          5          6          7
  1
  2
  3 Number      Date        Dep/Cred   Payment    Descriptio
  4
  5             08/01/83         500              Paycheck
  6        1236 08/03/83                   72.34 Sprint Jul
  7             08/04/83        13.7              Dinner w/D
  8        1237 08/04/83                   38.92 Groceries
  9        1238 08/07/83                   22.73 Newsweek 1
 10        1239 08/10/83                   239.7 Am Ex June
 11
 12
 13
 14                                              Balance
 15             Total           513.7     373.69     140.01
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R15C5    RC[-2]-RC[-1]                    98% Free       Multiplan: TEMP
```

date begins with a digit. We, however, want the date to be a label. If *Multiplan* thinks the date is a Value it will treat 8/16/83 as 8÷16÷83. Therefore, the date must be entered from the Alpha mode. The *Multiplan* work sheet should now look like the one in Table 4-4.

RELATIVE ADDRESSING VS. ABSOLUTE ADDRESSING

When building formulas there is a second way to specify coordinates. This method is called *relative addressing.* Relative addressing is very important when copying formulas and moving data around the spreadsheet. Sometimes formulas utilize both relative addressing and *absolute addressing* (the counterpart). You will see the full impact of relative addressing when you begin copying formulas later in the chapter. For now, relative addressing is simply an easier way to build formulas.

To illustrate relative addressing, change the formula for the balance at R15C5 to:

RC[−2]−RC[−1]

This formula takes the value from the cell in the same row and two columns to the left and subtracts the value from the cell in the same row and one column to the left. When the formula is located at R15C5 the value two columns to the left, RC[−2], comes from R15C3. The value one column to the left, RC[−1], comes from cell R15C4. (See illustration in Fig. 4-1.)

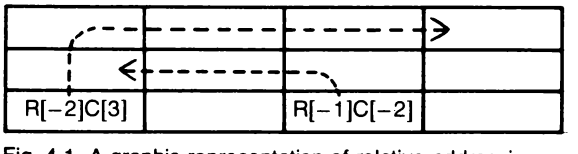


Fig. 4-1. A graphic representation of relative addressing.

To modify the formula, take the cursor to R15C5 and enter the Value mode. Then, using the arrow keys, move the cursor to position R15C3. You should notice two things, the position of the cursor on the spreadsheet and the development of the formula you are building. The formula development is displayed on the status line of the spreadsheet.

When the cursor is in place press the minus sign key, which is the same as a dash. The cursor will return to R15C5. Next, use the left arrow key to move the cursor toR15C4 and press the return key. The balance will be calculated, and you will see the formula at the status line. When building relative formulas only the arrow keys may be used to move the cell cursor. The GOTO command cannot be employed.

Using relative addressing, let's calculate the daily balance. This information will be seated in column 7. The first step to expand the spreadsheet is to enter the column heading, *Daily Bal*, in R3C7.

Calculating the daily balance is complex. The formula in R5C7 should give the balance on that specific day. In plain English, the formula adds the previous day's balance to the day's deposits and then subtracts the day's payments. The formula will apear as follows:

R[−1]C+RC[−4]−RC[−3]

Try interpreting this formula; translated it says take the value that is in the row above and in the same column, add the number that is in the same row but in the 4 columns to the left, and, finally, subtract the figure that is 3 columns to the left but the same row. If you understand this, get your boss to pat you on the back—then ask for a raise.

You may have noticed that the first cell referenced (R4C7) is blank. This cell is supposed to contain the previous day's balance. In this case the previous day's balance is considered zero because the cell is blank. This would be true if you just opened your checking account. A different formula could have been developed for this unique case, but we avoided uncomplicating matters. The exact same formula may be placed in R6C7, R7C7, and so on. Try entering the formula in the other cells for practice.

You may also use relative addressing when constructing formulas that use functions. Try rewriting the stagnant formula in R15C3. Enter the Value mode, then type "sum(." Now, move the cursor to the beginning of the column you are going to sum (R4C3); then press the colon key. Once you have done this, move the cursor to the end of the column you are going to sum (R13C3), and finish up with a ")." The final result should be:

SUM(R[−10]C:R[−2]C)

By this time you should be able to handle relative addressing with finesse. Practice using your new found skill. If you are a serious Multiplanner, you might consider turning off your computer and rebuilding the entire work sheet from scratch.

TRANSFERRING FILES FROM THE DISK DRIVE TO THE COMPUTER

Until now, you were unable to save your work sheet for future use. The only way to preserve the electronic work sheet would have been to leave the computer on for the duration of the life of the spreadsheet. This, of course, would be impractical. You would have no way to use other software programs without destroying your work sheet, and your computer would never have any time off.

The transfer command allows you to use the disk drives to store your *Multiplan* work sheet. Transfer also enables you to retrieve other work sheets from the disk drive, so that you can have a number of different work sheets and can switch from one to another as needed.

If it were the end of the day, you would probably want to save your updated checkbook and then turn off the computer. First you should type T from the command mode to use the Transfer command. You will have several options shown at the bottom of the screen:

TRANSFER: Load Save Clear Delete Options Rename
Select option or type command letter

We want to save the spreadsheet, so type *S* for save. Then *Multiplan* will ask the filename in the following manner:

TRANSFER SAVE filename: TEMP
Enter a filename

In this situation you would probably want to name your spreadsheet "checks." There are a variety of names you might have chosen. However, some computers require you to use names limited to one to eight letters. Different computers have different requirements. The Apple series for example, is not confined to these limitations. When picking names for your spreadsheets it is a good idea to pick names that you and others who might use the spreadsheet will easily remember and understand. "Checks" fits the requirements of the computer and seems easy to remember, so it is a logical choice.

Once you've made a decision you should inform *Multiplan* by typing *checks* and pressing the return key. Now, the spreadsheet, with all the formulas, figures, and titles, will be saved on the disk in the disk drive. The file may be reloaded into the computer's memory at any future date.

If you are satisfied that you have saved your work sheet in the correct manner, you may want to leave the *Multiplan* program. Be careful! If you quit before you have saved a spreadsheet, *Multiplan* will *not* have the latest figures in its records. New spreadsheets that have never been saved would be completely lost. Therefore, before you quit, be sure that you have saved the latest version of your spreadsheet. After saving the spreadsheet, turn off the computer, take a stretch, get a cup of coffee or tea, and then return, refreshed, to practice some more.

The partner of Save is Load. Once you are ready to continue, return to the command level in *Multiplan*. If the computer is off, you will have to reload *Multiplan* first. Then type *"T"* and press the return key to get to the Transfer mode. Once you are in the Transfer mode you will want to "load" the spreadsheet "checks" into *Multiplan*. Therefore, type *L* and press the return key to enter the "load" mode, and the screen will appear as follows:

TRANSFER LOAD filename:
Enter a filename or use direction keys to view directory

You may now type *checks* and press the return key. This will command *Multiplan* to find the spreadsheet "checks", load it into the computer's memory, and display it on the screen. If you have forgotten the exact name of the spreadsheet, you can review the list of files on the disk by pressing one of the arrow keys.

To see the directory, try using the load command once again. (Type *T* then *L*.) This time, instead of typing in "checks", tap one of the arrow keys on the right-hand side of the keyboard. *Multiplan* will then display a list of the programs on the disk (see Table 4-5).

One of these programs should be "checks," in the far right column. Using the arrow keys, you may move the cursor to the area containing the word "checks" and press the return key. Once again, *Multiplan* will proceed to remove the current spreadsheet from the screen load the file "checks" into the computer's memory, and display the file on the screen.

By now you ought to know how to load and save files, and how to exit (quit) from *Multiplan*. These commands are extremely important, and a working knowledge of them will be necessary before you can manipulate larger spreadsheets.

SPECIFYING RANGES WITH THE BLANK COMMAND

The Blank command is a very powerful command. It allows you to erase not only one cell at a time, but entire groups of cells. Blocks, rows, and columns of entries may be erased using the Blank command.

To begin with, assume you wanted to erase all the deposits in row 3 but wanted to preserve the titles and sum formulas at the bottom. The first step is to move cell cursor to the upper left-hand corner of the block of data you are going to remove (R5C3).

Table 4-5. A List of Files on a Floppy Disk Viewed with *Multiplan's* Transfer Command.

```
B:DIAG15.PIC      B:DIAG7.PIC       B:DIAG8.PIC       B:DIAG9.PIC
B:DIAG10.PIC      B:DIAG11.PIC      B:TEMP.PIC        B:DIAG12.PIC
B:DIAG13.PIC      B:DIAG14.PIC      B:INTEREST        B:CHECKS
B:CHECKBK2        B:INVOICE         B:TIMECARD        B:TIME1
B:TEST            B:BARGRAPH        B:LOOKUP          B:MPTEST
B:PAYROLLS        B:TIME2           B:STOCKS          B:NPV
B:NPV1            B:INTEREST.1      B:CHECKBK1


TRANSFER LOAD filename: B:CHECKS

Enter a filename, or use direction keys to view directory
R1C1                                  100% Free      Multiplan: TEMP
```

When you are at the coordinates of the doomed data, try going to the Blank command. (Press *B* when you are in the command mode.) *Multiplan* will respond as follows:

Blank cells: R5C3
Enter reference to cell or group of cells

The coordinates (R5C3) correspond with the current location of the cursor. In Chapter 3 you cleaned out one cell by pressing the return key at this point. This time, however, we want to destroy a group of entries.

To do this, proceed by typing :. Next, you will have to specify the second boundary of the area to be cleared. This may be done in two different ways. The first method involves simply typing the coordinates of the second location and then pressing the return key. The second method, the sophisticated one, involves moving the cursor to the desired boundary, and then pressing the return key. The results should look like those in Table 4-6.

Once all the deposits have been eliminated your balance may be in a woeful state. To remedy this situation you might want to do away with your payments, the titles, and the sums. This operation requires that you specify the block of information to be eliminated. So, move to the title "Dep/Cred" (R3C3) and then enter the Blank mode. With this done type : to separate the first coordinates from the second coordinates. Then enter the second coordinates (R15C4) using your favorite method, and complete the operation with the return key. The results will look like those in Table 4-7.

We hope this operation was not too prosaic. This style of designating coordinates to be affected is utilized by other commands. The Copy, Format, and Lock commands all use this style.

USING THE COPY COMMAND

The Copy command is perhaps the most useful command in *Multiplan*. The Copy command simply copies the exact contents of a cell or range of cells into another group of cells. The command may be used to copy numbers, formulas, and text. In fact, entire spreadsheets may be copied at one time.

Frequently you'll want the same formula in many different locations. The formula used to calculate the daily balance earlier in this chapter is one such example. Some formulas are very long and therefore difficult to type in. Even short formulas are not easy to type since they require that one's fingers leap from letters to numbers to arithmetic symbols on the keyboard. The Copy command eliminates this problem by allowing you to make replicas of existing data and formulas.

A good place to begin using the Copy command is with "checks," the checking account spreadsheet you have designed. To begin, use the Transfer command to load "checks" from the disk drive into the computer. The spreadsheet should resemble the one in Table 4-8.

Table 4-6. A Range of Cells Erased by the Blank Command.

```
#1       1         2         3         4         5         6         7
  1
  2
  3 Number     Date       Dep/Cred  Payment   Descriptio           Daily Bal
  4
  5            08/01/83        500            Paycheck                500
  6       1236 08/03/83                 72.34 Sprint Jul           427.66
  7            08/04/83       13.7            Dinner w/D          441.36
  8       1237 08/04/83                 38.92 Groceries           402.44
  9       1238 08/07/83                 22.73 Newsweek 1          379.71
 10       1239 08/10/83                 239.7 Am Ex June          140.01
 11
 12
 13
 14                                           Balance
 15            Total          513.7    373.69    140.01
 16
 17
 18
 19
 20
BLANK cells: R5C3:R13C3

Enter reference to cell or group of cells
R13C3                                      97% Free      Multiplan: b:checks



#1       1         2         3         4         5         6         7
  1
  2
  3 Number     Date       Dep/Cred  Payment   Descriptio           Daily Bal
  4
  5            08/01/83                       Paycheck                  0
  6       1236 08/03/83                 72.34 Sprint Jul           -72.34
  7            08/04/83                       Dinner w/D          -72.34
  8       1237 08/04/83                 38.92 Groceries          -111.26
  9       1238 08/07/83                 22.73 Newsweek 1         -133.99
 10       1239 08/10/83                 239.7 Am Ex June         -373.69
 11
 12
 13
 14                                           Balance
 15            Total              0    373.69   -373.69
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R5C3                                       98% Free      Multiplan: b:checks
```

Table 4-7. A Range of Cells Erased by the Blank Command.

```
#1       1         2         3         4         5         6         7
  1
  2
  3 Number     Date       Dep/Cred  Payment   Descriptio          Daily Bal
  4
  5            08/01/83                       Paycheck                  0
  6       1236 08/03/83                 72.34 Sprint Jul           -72.34
  7            08/04/83                       Dinner w/D          -72.34
  8       1237 08/04/83                 38.92 Groceries           -111.26
  9       1238 08/07/83                 22.73 Newsweek 1          -133.99
 10       1239 08/10/83                 239.7 Am Ex June          -373.69
 11
 12
 13
 14                                           Balance
 15            Total              0    373.69   -373.69
 16
 17
 18
 19
 20
BLANK cells: R3C3:R13C4

Enter reference to cell or group of cells
R13C4                                  .      95% Free      Multiplan: b:checks



#1       1         2         3         4         5         6         7
  1
  2
  3 Number     Date                             Descriptio          Daily Bal
  4
  5            08/01/83                       Paycheck                  0
  6       1236 08/03/83                       Sprint Jul                0
  7            08/04/83                       Dinner w/D                0
  8       1237 08/04/83                       Groceries                 0
  9       1238 08/07/83                       Newsweek 1                0
 10       1239 08/10/83                       Am Ex June                0
 11
 12
 13
 14                                           Balance
 15            Total              0         0         0
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R3C3                                         96% Free      Multiplan: b:checks
```

Table 4-8. Present State of the Spreadsheet Checks.

```
#1        1          2          3          4          5          6          7
  1
  2
  3 Number     Date       Dep/Cred   Payment    Descriptio           Daily Bal
  4
  5            08/01/83        500                Paycheck                 500
  6       1236 08/03/83                    72.34 Sprint Jul            427.66
  7            08/04/83       13.7               Dinner w/D           441.36
  8       1237 08/04/83                    38.92 Groceries            402.44
  9       1238 08/07/83                    22.73 Newsweek 1           379.71
 10       1239 08/10/83                    239.7 Am Ex June           140.01
 11
 12
 13
 14                                               Balance
 15            Total          513.7      373.69     140.01
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R1C1                                        95% Free       Multiplan: b:checks
```

At R10C7 is the formula to keep track of the daily balance. Without the Copy command it would take until the next ice age to type the formula for the cells between R11C7 and R13C7. Therefore, use the Copy command. Move to the cell you want to copy from (R10C7); then enter the Copy command mode by typing *C*. *Multiplan* will offer you three choices:

COPY: Right Down From
Select option or type command

The first two options, Right and Down, enable you to copy a formula or title along a straight line. The third option, From, is useful when copying blocks of formulas and titles. Right now you would like to copy down, therefore type *D* for Down, and *Multiplan* will show:

COPY DOWN Number of cells: Starting at:
Enter a number

Now, simply decide how many cells down you want to copy. You probably want to copy down 3 rows. This will place formulas in R11C7, R12C7, and R13C7. So type *3*. You are now obligated to tell *Multiplan* where it should start copying from. *Multiplan* gives you the coordinates of the cursor. If this is where you want to copy from, you may finish the process by pressing the return key. If you desire to change the coordinates, use the tab key to jump to "Starting at;" then move the cursor to where you do want to copy from. When you are at the desired location you should press the return key.

At this time the *Multiplan* display will be like the one in Table 4-9.

The technique for copying to the right is quite similar. You may go through the same steps you took to copy down.

The last task is to set up a balance sheet for the next month. Each month you may want to calculate your checking account on a new spreadsheet. This will help organize data.

Without the Copy command you would have had to build a new spreadsheet each month. With

Table 4-9. Results of Copying the Formula for the Balance.

```
#1        1          2          3          4          5          6          7
  1
  2
  3 Number      Date       Dep/Cred  Payment    Descriptio            Daily Bal
  4
  5             08/01/83         500             Paycheck                  500
  6       1236  08/03/83                  72.34  Sprint Jul             427.66
  7             08/04/83        13.7             Dinner w/D             441.36
  8       1237  08/04/83                  38.92  Groceries              402.44
  9       1238  08/07/83                  22.73  Newsweek 1             379.71
 10       1239  08/10/83                  239.7  Am Ex June             140.01
 11                                                                     140.01
 12                                                                     140.01
 13                                                                     140.01
 14                                             Balance
 15             Total           513.7     373.69     140.01
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R10C7     R[-1]C+RC[-4]-RC[-3]              95% Free       Multiplan: b:checks
```

the Copy command, however, you may create an exact duplicate of the original spreadsheet. To accomplish this, move to the upper left-hand corner of the region to be copied (R3C1). When you have reached this point, enter the Copy-From command mode by typing first *C*, then *F*. *Multiplan* will request additional information:

COPY FROM cells: R3C1 to cells:

The upper left-hand limit of the area to be copied is already marked. You need to mark the right-hand lower limit of the section of the spreadsheet to be copied. This requires a sequence of keystrokes first covered under Using the Blank Command in Chapter 3—where you used Blank to erase more than one cell at a time. First, type :, to prepare *Multiplan* for the second coordinate. Then move the cursor to the second set of coordinates or type them in manually (R15C7). The last task requires you to enter the position where the block will be placed. Press the tab key to fly the cursor over to "to cells;" then move it to position R3C9 and press the return key. This should create an identical spreadsheet. Then simply blank out the old figures under deposits and payments and enter next months' figures.

GETTING HELP FROM *MULTIPLAN*

Multiplan has an interactive self-help feature that is very sophisticated. The command is quite simple to use, and although it is not a teaching device, it will help you when you have forgotten what a certain command does. The help section of *Multiplan* is actually a twenty screen quick reference guide. In addition, there is a powerful automatic index that takes you to the proper screen in the help menu.

To use the help menu simply type ? *Multiplan* will find the section of the help menu that pertains to the Command you are using. If, for example, you were at the Transfer Command (use the space bar and the backspace to move there), but you could not

remember what Load and Save were for, you might type *?* to summon help. *Multiplan* answers your call by displaying the section on transferring files. Read over the section—there is a good chance it will refresh your memory. If you have not already tried it, test the help feature now.

Once the help menu is being displayed you have several options available. The first option is resume, which returns you to your position before you asked for help. The second option is start, which places you at the introduction to the entire help menu. The third and fourth options take you to the next or previous help menu page, respectively.

The second row of options offers you a chance to jump to another section of the help menu on a broader subject, such as formulas. Practice a little with the help feature. Try each of the options until you feel confident of your abilities to summon help. Rehash some of the material presented earlier, then move on to Chapter 5.

Chapter 5
Formatting the Spreadsheet

Now that we have put Data Research out of business with our checkbook, let's go for IBM.

The checking account work sheet is functionally sound. However, one may find the table aesthetically unappetizing. The dollar amounts are not aligned along the decimal point. The word "Description" is not completely visible, and the headings like "Number" are not directly over the numbers they represent. These flaws are minor. However, should you want to present this spreadsheet at a semiannual company conference, you would want it to be neatly arranged and easy to read.

Formatting commands allow you to set up titles and numbers according to certain patterns. For example you may want some numbers displayed as percentages and others as dollars and cents. Neither of these features is essential, but both would be aesthetically appealing.

CHANGING ONE CELL TO DOLLAR SIGN FORMAT

The first feature you may want to change involves converting the numbers under Dep/Cred, Payments, and Balances to dollars and cents. Move the cell cursor to the first figure under deposits (R4C3) and enter the Format mode by typing *F*. We should see the following on the screen:

FORMAT: Cells Default Options Width

The option "Cells" sets the format in a specific range of cells. To illustrate the Format Cells command we will begin by changing the format in one cell. Try selecting the Cells option (Press "C"). Once you have entered the Cells option *Multiplan* will display the lines shown in Fig. 5-1 at the status line.

Mosey on over to Format Code, using the tab key. Scrutinize the line; the brackets have encircled "Def." Def is an abbreviation of the word default. When the format code for an individual cell is in the Default mode, the cell assumes the format specified for the entire work sheet.

```
FORMAT cells:  R5C3              alignment: (Def)Ctr Gen Left Right -
format code: (Def)Cont Exp Fix Gen Int $ * % -     # of decimals: 0
Enter reference to cell or group of cells
```

Fig. 5-1. The status line under the Cells option of format.

Which option will convert the number in R5C3 to dollars and cents? If you said "$", you are correct. Proceed by typing *$* and pressing the return key. You may want to try changing a few other numbers to dollar sign format to familiarize yourself with the option. To avoid being redundant, we will refrain from instructing you to press the return key in the future. A good rule-of-thumb for those who are unsure when to hit the return key and when not to is—if neither the screen nor the disk drives change after you have typed your information, you should press return.

The number that was in position R5C3 has been changed to dollar sign format as shown in Table 5-1. A dollar sign appears in front of the figure. There is also a decimal point with two numbers to the right of it. All these changes may be observed on the monitor; however, the original number has not been harmed. If the original number had been 6.1, the number exhibited would now be $6.10, but the computer, like an elephant that never forgets, would still remember 6.1. When the format code is changed back to normal the computer will display 6.1. This may seem minor now but it shows that Microsoft was very thoughtful when designing *Multiplan*.

CHANGING A RANGE OF CELLS TO DOLLAR SIGN FORMAT

Just as you would not want to switch on all the

Table 5-1. The Spreadsheet after the Cell at Row 5 Column 3 Has Been Changed to Dollar Sign Format.

```
#1        1          2          3          4          5          6          7
  1
  2
  3 Number     Date       Dep/Cred  Payment    Descriptio           Daily Bal
  4
  5            08/01/83    $500.00             Paycheck                  500
  6       1236 08/03/83                 72.34 Sprint Jul              427.66
  7            08/04/83        13.7           Dinner w/D              441.36
  8       1237 08/04/83                 38.92 Groceries               402.44
  9       1238 08/07/83                 22.73 Newsweek 1              379.71
 10       1239 08/10/83                 239.7 Am Ex June              140.01
 11
 12
 13
 14                                           Balance
 15            Total          513.7    373.69    140.01
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R5C3     500                                 95% Free      Multiplan: b:checks
```

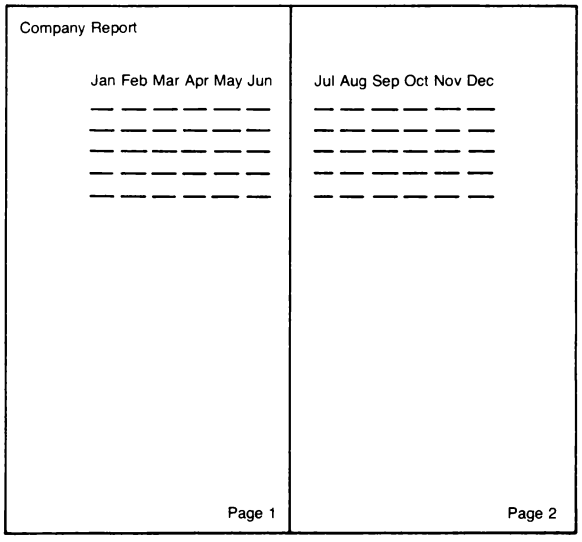


Fig. 5-2. A large spreadsheet may be printed out in sections. *Multiplan* divides the printout according to your printer specifications.

lights of a Christmas tree one at a time, you would not want to change each number to dollar sign format one cell at a time. Instead of specifying one cell to be changed, specify a collection of cells for modification. (The method is discussed in detail in Chapter 4 under Specifying Ranges with the Blank Command.) When you are in the Format mode and *Multiplan* asks which cells need to be formatted, type in a range of cells. This technique may be used to change all the numbers on any spreadsheet to dollar sign format in a few steps.

The cells under Dep/Credits, Payments, and Daily Balance should be switched to dollars and cents. First select the Format command, then choose the Cell option. First type *F*; then type *C*. The lines in Fig. 5-2 should appear on the lower half of the screen. (The brackets and cell coordinates may appear differently.)

The range of cells to be formatted should be changed to R5C3:R15C4. This encompasses the

Table 5-2. Appearance of the Spreadsheet after All.Dollar Amounts Have Been Converted to Dollar Sign Format.

```
#1        1          2          3          4          5          6          7
   1
   2
   3 Number     Date       Dep/Cred   Payment    Descriptio           Daily Bal
   4
   5            08/01/83    $500.00              Paycheck               $500.00
   6       1236 08/03/83                $72.34 Sprint Jul             $427.66
   7            08/04/83     $13.70             Dinner w/D             $441.36
   8       1237 08/04/83                $38.92 Groceries              $402.44
   9       1238 08/07/83                $22.73 Newsweek 1             $379.71
  10       1239 08/10/83               $239.70 Am Ex June             $140.01
  11                                                                  $140.01
  12                                                                  $140.01
  13                                                                  $140.01
  14                                             Balance
  15            Total       $513.70    $373.69    $140.01
  16
  17
  18
  19
  20
COMMAND:  Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
          Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R5C7      R[-1]C+RC[-4]-RC[-3]              94% Free       Multiplan: b:checks
```

Dep/Credits and the Payment. Then tab over to the format code and change it to "$." This sets more than twenty cells to dollar sign format in one fell swoop. The daily balance may also be formatted using this technique. The one-eyed monster should look like the results in Table 5-2.

You may have noticed that blank cells may be set to dollar sign format (or any other format). When numbers are placed in the cell, the numbers will be displayed in dollar sign format. Also it should be mentioned that only numbers are altered by dollar sign formats; text is unaffected.

USING CONTINUOUS FORMAT

After all the numbers have been formatted, you may want to alter specific titles. The word "Description" appears as "Descriptio." The heading should be fully exposed. The best way to do this is by formatting its cell and the adjacent cell using the continuous option. If we format R3C5 and R3C6 as continuous, titles originating in R3C5 may extend into R3C6 (but only if R3C6 would normally be blank). This method is the best way to display long titles.

First enter the format mode and specify the range of cells (R3C5:R3C6). Then ramble on over to the format code options. The option to grab is "cont." a contraction of the word "continuous." Type *C* to indicate your choice. The entire word "Description" will be displayed in the two adjacent locations.

CHANGING THE ALIGNMENT OF CELLS

Now, the spreadsheet is beginning to look like a Rembrandt painting. Okay, maybe not quite a Rembrandt. The next artistic enhancement is to place titles, such as "Number" in the center of their cells. This also requires the Format command. Choose it and prepare to change "alignment." Normally alignment is on "Def," which means default. Default aligns all the labels according to the format specified for the entire work sheet.

When you use a fresh work sheet the setting for the entire work sheet is "Gen" (General). General aligns titles along the left border of the cells, and the values along the right border of the cells. This is how titles and values appear on receipts, invoices, and other tables of numbers and words. In *Multiplan's* raw unaltered state the alignment mode for each cell appears as "Def" (Default).

Left, Right, and Centered Alignment

Left-justified words and right-justified numbers creates problems. There are times when your columns may appear as follows:

Month	Day	Year
4	15	83

Information presented in the above manner is confusing. It is difficult to interpret and looks disorganized. The Format Alignment commands may be used to improve your style of presentation. The list of possibilities will resemble those in Fig. 5-1, shown earlier.

If you have grasped everything said in the beginning of the chapter the list of options will seem relatively easy. "Left" pushes both numbers and words to the cell's left margin. "Right" does the opposite, forcing data to the cell's right wall. "Ctr," an abbreviation of the word center, will center both numbers and words in the cell. To align month, day, and year, above, with their corresponding numbers, you would right-justify the titles.

On the checkbook spreadsheet that we have designed, the title "Number" should be centered over the numbers it pertains to. The Center option may be used to accomplish this. Simply enter the Format command by (typing *F* from the command mode); then select the Cells option (by typing *C*). Then set the format alignment to center. Your spreadsheet should resemble the one in Table 5-3.

DEFAULT, GENERAL, AND DASH

Default and General modes may also be set for specific cells. As mentioned earlier in the chapter, Default succumbs to peer pressure and assumes the setting being used for the entire work sheet, and General aligns numbers on the right side of the cell and words on the left side of the cell.

Dash, typed as "-," is used when changing the format code for a group of cells. When used it tells

Table 5-3. The Spreadsheet after the Cell at Row 3 Column 1 Has Been Switched to Center Alignment.

```
#1        1          2          3          4          5          6          7
  1
  2
  3    Number   Date       Dep/Cred   Payment    Description           Daily Bal
  4
  5              08/01/83    $500.00              Paycheck                $500.00
  6        1236  08/03/83                $72.34   Sprint Jul              $427.66
  7              08/04/83     $13.70              Dinner w/D              $441.36
  8        1237  08/04/83                $38.92   Groceries               $402.44
  9        1238  08/07/83                $22.73   Newsweek 1              $379.71
 10        1239  08/10/83               $239.70   Am Ex June              $140.01
 11                                                                       $140.01
 12                                                                       $140.01
 13                                                                       $140.01
 14                                               Balance
 15              Total      $513.70    $373.69     $140.01
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R3C1     "Number"                          94% Free       Multiplan: b:checks
```

Multiplan not to alter the alignment of the cells. Thus the format code may be altered without affecting the alignments.

At this time it might be beneficial to practice with the various formatting functions covered. One may switch numbers from dollar sign format to General format and vice-versa. Titles and numbers may be aligned in different manners. You cannot hurt the computer by experimenting with different format codes, so feel free to experiment.

PRINTING THE SPREADSHEET

You may bypass this section if you do not have a printer. But if you do have a printer, forge ahead.

Now that the spreadsheet is fit for a corporate president, it is time to unveil it. A *hardcopy,* as it is called in the industry, has several advantages over a *softcopy.* (The spreadsheet stored on the floppy disk is the softcopy.)

First, you can show much more on the hardcopy. You can get about sixty lines and eighty characters on one page of 8.5 × 11-inch paper. And you can fit up to 240 characters on one page if you use compressed type and a printer with a fifteen inch carriage. A good-sized monitor only displays eighty characters and 25 lines—not much of a visual aid.

Second, a hardcopy is a durable version of the spreadsheet that may be exhibited and reviewed anytime, anywhere. If you spill orange juice on both a hardcopy and a softcopy, which one do you think will survive? Moreover, the hardcopy does not require a half-ton computer system to review the figures.

First select the Print command by typing "P" while in the command mode. *Multiplan* will inform you of the following options:

PRINT: Printer File Margins Options
Select option or type a command letter

Using the printer, just as playing football, requires planning. The first step is to see if the margins are correct. If you select the Margins option, *Multiplan* should show the following:

PRINT MARGINS: left: 5 top: 6 print width: 70
print length: 54 page length: 66

Your printer is probably using standard 8½ × 11-inch paper. If this is the case then the margins have been preset appropriately. If you are not using standard-sized paper, it will be necessary to change some of these numbers. This must be done before printing is initiated.

Once the margins are set, it is necessary to pick the options. When you go after the option mode, *Multiplan,* eager to please, will offer you:

PRINT OPTIONS: area:R1:255C1:63 setup: formulas: Yes(No)row-col numbers: Yes(No)

The only item we want to alter is the area. We should change the specified area to include only the information you are concerned with. Notice that the option area is R1:255C1:63, rows 1 through 255 and columns 1 through 63. The spreadsheet we prepared in Chapters 4 and 5 should have the area R1C1:R15C7. When this is done you are ready for the finest hour.

After the margins and the options have been set, select the Printer command. This will send the designated area of the work sheet currently on the video screen to the printer. If all the equipment has been assembled properly, a hardcopy of the chosen area will be produced. Wait until *Multiplan* displays the list of commands before proceeding.

If your spreadsheet is too large to print on a single page it will be necessary to do some patchwork. We can print out the sheet in a number or sections and then paste them together.

For example, we can print out the sheet in Fig. 5-3 in two sections. The print area for section 1

Table 5-4. Two Printouts, One with Row and Column Numbers, the Other without Row and Column Numbers.

	Number	Date	Dep/Cred	Payment	Description	Daily Bal
		08/01/83	$500.00		Paycheck	$500.00
	1236	08/03/83		$72.34	Sprint Jul	$427.66
		08/04/83	$13.70		Dinner w/D	$441.36
	1237	08/04/83		$38.92	Groceries	$402.44
	1238	08/07/83		$22.73	Newsweek 1	$379.71
	1239	08/10/83		$239.70	Am Ex June	$140.01
					Balance	
		Total	$513.70	$373.69	$140.01	

	1	2	3	4	5	6	7
1							
2							
3	Number	Date	Dep/Cred	Payment	Description		Daily Bal
4							
5		08/01/83	$500.00		Paycheck		$500.00
6	1236	08/03/83		$72.34	Sprint Jul		$427.66
7		08/04/83	$13.70		Dinner w/D		$441.36
8	1237	08/04/83		$38.92	Groceries		$402.44
9	1238	08/07/83		$22.73	Newsweek 1		$379.71
10	1239	08/10/83		$239.70	Am Ex June		$140.01
11							
12							
13							
14					Balance		
15		Total	$513.70	$373.69	$140.01		

would be R1C1:R12C7. The print area for section 2 would be R1C8:R12C14. This method is not easy, and explains the appeal of 16-inch printers.

ADVANCED PRINTER OPTIONS

There are three choices under printer options that you might want to explore after you become a *Multiplan* veteran.

PRINT OPTIONS: area:R1:255C1:63 setup: formulas: Yes(No)row-col numbers: Yes(No)

Sometimes while using *Multiplan* you will need a spreadsheet with numbers designating columns and rows. When "row-col numbers" are switched to "Yes" the row and column numbers on the screen will also be printed, which may be especially helpful when assimilating several printed sections of much larger spreadsheet material. (Note the difference when the line numbers are printed shown in Table 5-4.) Use the tab key to move the parentheses to "Yes" or "No" to have numbers or not.

A second option that you may wish to review is "formulas." This option is normally left off (set to "No") However, since the computer never forgets, if you care to review the formulas used to design the spreadsheet, use this option. When the parentheses are embracing "Yes" the printout will reveal all the formulas instead of the numbers you normally see.

The third option involves setup, which is used when configuring your particular printer. If you want compressed mode on a dot matrix printer for example, you may use this command. Since different printer manufacturers use different codes, consult the printer's operations manual about setup.

INSERTING AND DELETING ROWS AND COLUMNS

One of the reasons why electronic spreadsheets are selling like ice cream in July is that they are far more flexible than paper and pencil spreadsheets. Electronic spreadsheets are dynamic; they enable you to move data quickly and efficiently. Unlike the pencil and paper method, you will never be buried in a sea of eraser shavings, be troubled about being neat, or fear your last calculation was inaccurate.

Insert and Delete commands are needed when you want to expand or contract your spreadsheet. Take the checking account example. There may be a month, perhaps December, when you have a large number of transactions to record. There are too many transactions and not enough rows to record them. What do you do? Use the Insert command.

Employing Insert

Before employing the Insert command, march the cell cursor to the area where you want to insert the rows (move to row 13). The insert command will place lines between rows 12 and 13.

Hike the cursor over to R13C3 and administer the Insert command. Obsequious *Multiplan* says:

INSERT Row Column
Select option or type command letter

At this moment you need to insert a row. Type *R* and *Multiplan* will show:

INSERT ROW # of rows: 1 before row: 13
between columns: 1 and: 63

Enter a number

Multiplan's display (above) indicates you want to insert one row before row 13. You may however, tell *Multiplan* otherwise. Since you are in control here, why not insert three rows? If you want to insert these rows only in certain columns, you may specify which columns you want. Right now it would be best to insert rows between columns two and six.

Inserting and deleting rows and columns will affect some formulas on the spreadsheet. Formulas using relative referencing will not change, but the data they work with will. Absolute formulas, on the other hand, will be automatically modified to reflect the change in location. For example, the formula in R15C3 is sum (R4C3:R13C3). If we insert a row at row 13, the formula in R15C3 will move down to R16C3 and the formula will change to (R4C3:R14C3). (See Table 5-5.)

Table 5-5. The Effects of Inserting a Row at Row 13.
(Notice that the Formulas Defined Earlier Have Automatically Been Modified to Accommodate the New Row.)

```
#1        1          2          3          4          5          6          7
  1
  2
  3    Number   Date       Dep/Cred   Payment    Description           Daily Bal
  4
  5             08/01/83    $500.00                Paycheck                $500.00
  6        1236 08/03/83                $72.34    Sprint Jul              $427.66
  7             08/04/83     $13.70               Dinner w/D              $441.36
  8        1237 08/04/83                $38.92    Groceries               $402.44
  9        1238 08/07/83                $22.73    Newsweek 1              $379.71
 10        1239 08/10/83               $239.70    Am Ex June              $140.01
 11
 12
 13
 14
 15                                               Balance
 16             Total       $513.70    $373.69     $140.01
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R16C3    SUM(R4C3:R14C3)                    94% Free       Multiplan: b:checks
```

Had we inserted a row at row 14, the formula at R15C3 would not have been modified, because row 14 is not included in the original formula.

Multiplan, although many times faster than its paper spreadsheet cousin, finds calculating large spreadsheets a difficult task. The more entries there are, the longer *Multiplan* will take to recalculate the work sheet when new data is introduced. Therefore, it is unwise to insert a superfluous number of spaces.

Employing Delete

The reverse of Insert is Delete. Delete removes a row or column from the spreadsheet with vicious finality. Extreme caution must be used, or a column of data might accidentally be permanently removed. With this warning in mind let's cautiously remove one of the rows just inserted.

When you are at the highest command level, initiate the Delete command. Once in the Delete mode, *Multiplan* will say:

DELETE: Row Column
Select option or type command letter

You want to delete a row, so choose the corresponding option. After this motion *Multiplan* presents:

DELETE ROW # of rows: 1 starting at: 13
between columns: 1 and: 63
Enter a number

The Delete command is extraordinarily similar to its counterpart, Insert. Specify the number of rows to delete, the place to begin deleting rows from, and finally the number of columns it applies to. This routine should seem relatively easy at this point. Again, practice inserting and deleting rows or columns. Once you are satisfied with your skills, strut to the next section.

Chapter 6

Constructing a Timecard

By now you should be a *Multiplan* ace. If you have some ideas of your own, you may want to rush off and try to incorporate them in a spreadsheet. By all means do. You may want to try some of the applications introduced in this final section of the book. These applications will introduce new commands and new ideas that you may want to incorporate in your own spreadsheet design.

In many businesses, one application that is often still done by hand is timecards. Converting hours to minutes, determining total hours worked, and, finally, calculating wages paid to the employee and wages paid to the government are tasks better fit for your computer. With a computer and an electronic work sheet one may ingeniously calculate overtime, FICA, and other tax withholdings. All that *Multiplan* requires is someone to punch in the correct figures for the time the worker clocked in and clocked out. A sample timecard is shown in Table 6-1.

The first step in constructing the time sheet is fashioning titles. The listing of instructions in Table 6-2 (also called the *coding*) gives the location for each title. Place each one at the designated coordinates and use the appropriate formatting commands. You should end up with a time sheet like the one in Table 6-3.

A 24-hour clock is employed to indicate the time in and time out. (Remember, one in the afternoon is represented as 13, and seven at night is represented as 19.) The 24-hour clock eliminates the need to specify A.M. or P.M. It simplifies the time sheet, making it easier to utilize and faster to run. In addition, the hours and minutes are split and placed in two separate cells. This, too, is done in the interest of calculating ease. More advanced time sheets may be constructed without this feature.

The second step requires you to enter the formulas. The formulas, their coordinates, and a list of commands to enter the formulas is documented in Table 6-4. Table 6-5 shows the time sheet produced by the code in Table 6-4.

REVIEWING THE CODE

Step one in Table 6-4 shows the formula for

Table 6-1. The Completed Timecard.

	1	2	3	4	5	6	7	8
1	Employee Time Card:	Designed Oct, 1983						
2								
3	Date:							
4	Employee: Penny Smith							
5								
6		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7	Hour In	9	9	10	9	10	10	
8	Minute In	5	12	24	7	15	30	
9	Hour Out	12	12	12	12	12	13	
10	Minute Out	1	3	2	0	1	30	
11	Hour In	12	13	12	13	12		
12	Minute In	59	0	58	1	59		
13	Hour Out	17	18	17	19	18		
14	Minute Out	45	30	51	15	12		
15								
16	Days Hours	7.70	8.35	6.52	9.12	6.98	3.00	0.00
17								
18	Total Hours Worked for Week			41.67	Wage/hr	$8.35		
19								
20		Total Pay	$354.88		Take Home	$220.02		
21		Normal	$334.00		Fica	$23.78		
22		Overtime	$20.88		Fed Tax	$60.33		
23					State Tax	$39.04		
24					City Tax	$11.71		

calculating hours worked. You probably will not love this formula at first sight. It may seem long and ornery. Nevertheless, before you become discouraged, take a closer look. Within each set of parentheses, the time is converted to minutes. The number of hours is multiplied by sixty, and then the number of minutes is added to the result. Next, to determine the number of minutes spent in the office, the time in is subtracted from the time out.

Take a step back to get a better perspective. If the person came in at 9:00 and left at 17:00 then one could calculate how many hours the person was in the office by subtracting 9 from 17 (17–9). The answer is eight, which is how many hours the person worked. The formula we are assimilating uses a similar approach. It first, however, converts hours to minutes to determine the minute the employee came in and the minute he left. The time in is subtracted from the time out, yielding the number of minutes the person worked. The last calculation converts minutes to hours by dividing the number of minutes by sixty.

The remainder of the code is much less garbled. Steps two and three simply replicate the overgrown formula for each day of the week. Step four then adds the hours to yield the total hours worked each day. Step eight multiplies the result of step four by the hourly wage.

Steps nine, ten, eleven, and twelve determine deductions to be made for tax purposes. The federal tax has been pegged at 17 percent, state tax at 11 percent, and city tax at 3.3 percent. FICA is 6.7 percent. Due to the graduated tax system these rates will vary at different income levels. If ordered

to do so, *Multiplan* will assist you in calculating graduated tax rates. You'll have to use logical functions and lookup tables to determine graduated rates. Logical functions will be introduced later in this chapter and lookup tables later in the book.

Step thirteen simply determines the take home pay by deducting taxes from the total pay. Step fourteen changes the format of the pay to dollar sign format.

EDITING ENTRIES

In the not so distant past when you discovered an error in one of the cells, you were condemned to retype the entire entry. In those days, life was

Table 6-2. Coding the Titles, Data, and Formatting for the Spreadsheet.

	Coord.	Commands/Formulas	Explanation
1	R1C1	F	start format command
		C	select cells option
		:R5C7	set range of cells to format
		<TAB> <TAB>	set format code
		C <RETURN>	to continuous format
2	R1C1	A	enter alpha (text) mode
		Employee Timecard:	
		Designed Oct, 1983	
		DOWN ARROW DOWN ARROW	
		Date:	
		Employee: Penny Smith	
		<RETURN>	Enter titles
3	R6C1	F	start format command
		C	select cells option
		:R6C8	set range of cells to format
		<TAB>	set alignment
		R <RETURN>	to right justified
4	R6C2	A	enter alpha (text) mode
		Monday RIGHT ARROW	
		Tuesday RIGHT ARROW	
		Wednesday RIGHT ARROW	
		Thursday RIGHT ARROW	
		Friday RIGHT ARROW	
		Saturday RIGHT ARROW	
		Sunday	
		<RETURN>	enter titles
5	R18C1	F	initiate format command
		C	select cells option
		:R18C3	set range
		<TAB> <TAB>	set format code
		C <RETURN>	to continuous format
6	R18C1	A	enter alpha mode
		Total Hours Worked for	
		Week <RETURN>	enter titles
7	enter the remaining titles		
8	enter numbers for time in and time out under the corresponding days of the week		

Table 6-3. Titles and Data Corresponding to the Coding in Table 6-2.

	1	2	3	4	5	6	7	8
1	Employee Time Card:	Designed Oct, 1983						
2								
3	Date:							
4	Employee: Penny Smith							
5								
6		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7	Hour In	9	9	10	9	10	10	
8	Minute In	5	12	24	7	15	30	
9	Hour Out	12	12	12	12	12	13	
10	Minute Out	1	3	2	0	1	30	
11	Hour In	12	13	12	13	12		
12	Minute In	59	0	58	1	59		
13	Hour Out	17	18	17	19	18		
14	Minute Out	45	30	51	15	12		
15								
16	Days Hours							
17								
18	Total Hours Worked for Week				Wage/hr			
19								
20		Total Pay			Take Home			
21					Fica			
22					Fed Tax			
23					State Tax			
24					City Tax			

markedly easier, but now you are manipulating formulas that make the Great Wall of China look short. Retyping a formula like that might take centuries.

There is a better way. It involves employing the Edit command. To sample some of its capabilities, move to R1C1 and prepare to edit the title. Perhaps you want to record the date you designed the spreadsheet. From the command mode type *E* to initiate the process.

The text you typed will appear on the data status line. Now you have a chance to correct any mistakes. The IBM's backspace key will delete a character to the left of the cursor. (Check the *Multiplan* reference guide to determine the correct keys for your system.) First delete "Oct, 1983" with the backspace key. Then type the correct date. End the line with a quotation mark. Then press the return key.

Next, suppose you wanted to lower the state tax rate. Ramble the cursor over to the correct cell, then enter the edit mode. On the IBM you may use function keys F1 and F2 to move left and right, respectively. Perhaps the state income tax is 8 percent in your state. Use the F1 key to journey over to the figure ".11." then abolish it (with the backspace key). Then proceed to enter *.08*. Editing will prove convenient for reshaping inaccurate formulas.

EXPLOITING THE BENEFITS OF THE NAME COMMAND

By now you probably realize that formulas are beastly. Try reviewing some of the formulas you

Table 6-4. Coding for the Formulas Used in Timecard.

	Coord.	Commands/Formulas	Explanation
1	R16C2	((R[−7]C*60+R[−6]C)− (R[−9]C*60+R[−8]C)+ (R[−3]C*60+R[−2]C)− (R[−5]C*60+R[−4]C))/60 <RETURN>	formula to calculate the number of hours worked (remember, you may move to the proper location with the arrow keys to specify coordinates)
2	R16C2	C R 6 <RETURN>	copy the formula to the right six cells
3	R16C2	F C :R16C8 <TAB> <TAB> F <TAB> 2 <RETURN>	format the cells in the range R16C2:R16C8 change the format code to a fixed decimal with two decimal places
4	R18C4	V sum(R[−2]C[−2]:R[−2]C[+4]) <RETURN>	enter the value mode sum of the hours worked each day
5	R18C4	F C <TAB> <TAB> F <TAB> 2 <RETURN>	format the cell R18C4 change the format code to a fixed decimal with two decimal places
6	R18C6	8.35 <RETURN>	enter a value
7	R18C6	F C <TAB> <TAB> $ <RETURN>	change the format of the cell R18C6 change the format code to dollar sign format
8	R20C3	V R[−2]C[+3]*R[−2]C[+1]	enter the value mode (use arrow keys to enter the following formulas) total pay
9	R21C6	.067*R[−2]C[−3]	
10	R22C6	.17*R[−2]C[−3]	
11	R23C6	.11*R[−3]C[−3]	
12	R24C6	.033*R[−4]C[−3]	
13	R20C6	V RC[−3]−R[+1]C−R[+2]R[+3] C−R[+4]C	enter the value mode
14	R20C3	F C :R24C6 <TAB> <TAB> $	change the format of cells in the range R20C3:R24C6 to dollar sign format

Table 6-5. Timecard with the Formulas in Place.

	1	2	3	4	5	6	7	8
1	Employee Time Card:	Designed Oct, 1983						
2								
3	Date:							
4	Employee: Penny Smith							
5								
6		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7	Hour In	9	9	10	9	10	10	
8	Minute In	5	12	24	7	15	30	
9	Hour Out	12	12	12	12	12	13	
10	Minute Out	1	3	2	0	1	30	
11	Hour In	12	13	12	13	12		
12	Minute In	59	0	58	1	59		
13	Hour Out	17	18	17	19	18		
14	Minute Out	45	30	51	15	12		
15								
16	Days Hours	7.70	8.35	6.52	9.12	6.98	3.00	0.00
17								
18	Total Hours Worked for Week			41.67	Wage/hr	$8.35		
19								
20	Total Pay	$347.92			Take Home	$215.71		
21					Fica	$23.31		
22					Fed Tax	$59.15		
23					State Tax	$38.27		
24					City Tax	$11.48		

have entered, they look like hieroglyphics. Building new formulas is not always easy either. You may tame these formulas with the Name command. Name allows you to refer to cells and groups of cells with meaningful words such as "Wages" or "Weeks_Expenses" instead of cumbersome and enigmatic coordinates like R31C13 or R13C10:R20C15.

To start with, lets give a name to the values listed under "Days Hours." Stroll the cursor to R16C1 and trigger the Name command. *Multiplan* will show the following information:

Name: define name: Days_Hours to refer to R16C1

Enter name

Multiplan offers a name to you. There are no spaces allowed in the name, so spaces are represented by underlines. If you do not like the suggested name, you can enter your own name, but for now let's go with the flow and leave the given name intact. Next, specify the range of cells that "Days_Hours" refers to (R16C2:R16C8). There are several rules that must be obeyed when Naming cells. Names may not be longer than 31 characters or numbers, and the first character must be a letter. It is not necessary to memorize the rules because *Multiplan* will remind you when you goof.

Congratulations! You have just christened your first family of cells! These cells are not just numbers, they have names! So call them by their names. Transform the formula for total hours worked to a more refined state. Strut over to R18C4 and replace the uncivilized formula by typing

Table 6-6. Moving Data Around a Functioning Spreadsheet Requires Great Caution and Finesse.

```
#1        1          2          3          4          5          6          7
  1
  2
  3    Number      Date     Dep/Cred   Payment   Daily Bal Description
  4
  5             08/01/83    $500.00    $150.00    $350.00 Paycheck
  6       1101  08/02/83                $75.00    $275.00 Phone
  7       1102  08/02/83               $100.00    $175.00 PBS donation
  8                                               $175.00
  9                                               $175.00
 10                                               $175.00
 11
 12
 13
 14                                            Balance
 15             Total        $500.00    $325.00    $175.00
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R15C6                                      95% Free       Multiplan: b:checkbk
```

```
#1        1          2          3          4          5          6          7
  1
  2
  3    Number      Date     Dep/Cred   Payment   Description          Daily Bal
  4
  5             08/01/83    $500.00    $150.00 Paycheck                $350.00
  6       1101  08/02/83                $75.00 Phone                   $275.00
  7       1102  08/02/83               $100.00 PBS donation            $175.00
  8                                                                    $175.00
  9                                                                    $175.00
 10                                                                    $175.00
 11
 12
 13
 14                                            Balance
 15             Total        $500.00    $325.00    $175.00
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
R14C7                                      95% Free       Multiplan: b:checkbk
```

SUM(Days_Hours). This is a remarkable difference. The formula's purpose may be understood in a single glance.

Try giving some more names to cells. Name "Wage/hr" "Wagehr" and name "Total hours Worked for Week" "Total_Hours." To calculate "Total Pay," remind *Multiplan* that "Wagehr" and "Total_Hours" are values (enter the Value mode) and employ the formula "Wage/hr * Total_Hours." That formula is far easier to deal with than R[−2]C[+1]*R[−2]C[+3].

REARRANGING DATA ON THE SPREADSHEET

For those who have already mastered the Insert, Delete, Blank, and Copy commands, the Move command will seem antiquated. The Move command enables you to move rows or columns to a new location on the spreadsheet. Unfortunately the Move command transposes the entire row or column; everything, including tonight's roast, is moved!

The Copy, Delete, Insert, and Blank commands may be used to move a specific range of cells, as we will explain shortly. The moving technique we will use, although more complicated, is more selective.

We may want the checkbook balance sheet to appear as follows:

The daily balance must be moved without moving the total balance. We may accomplish this by following these steps:

1. Move the cells in column 5 to column 7.

Table 6-7. Timecard with Additions to Calculate Normal and Overtime Pay. ("Wage/hr" is Defined in a Separate Cell, and not in a Formula, Allowing Wage Rates to Be Changed Easily.)

	1	2	3	4	5	6	7	8
1	Employee Time Card:	Designed Oct, 1983						
2								
3	Date:							
4	Employee: Penny Smith							
5								
6		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7	Hour In	9	9	10	9	10	10	
8	Minute In	5	12	24	7	15	30	
9	Hour Out	12	12	12	12	12	13	
10	Minute Out	1	3	2	0	1	30	
11	Hour In	12	13	12	13	12		
12	Minute In	59	0	58	1	59		
13	Hour Out	17	18	17	19	18		
14	Minute Out	45	30	51	15	12		
15								
16	Days Hours	7.70	8.35	6.52	9.12	6.98	3.00	0.00
17								
18	Total Hours Worked for Week			41.67	Wage/hr	$8.35		
19								
20		Total Pay	$354.88		Take Home	$220.02		
21		Normal	$334.00		Fica	$23.78		
22		Overtime	$20.88		Fed Tax	$60.33		
23					State Tax	$39.04		
24					City Tax	$11.71		

Table 6-8. Coding to Calculate Normal and Overtime Pay.

	Coord.	Commands/Formulas	Explanation
1	R21C3	V IF(Total_Hours>40,40*Wagehr, Total_Hours*Wagehr) <RETURN>	enter the value mode
2	R22C3	V IF(Total_Hours>40, (Total_Hours−40)*1.5*Wagehr,0) <RETURN>	enter the value mode
3	R21C2	A Normal DOWN ARROW Overtime <RETURN>	enter the alpha mode enter the titles
4	R20C3	V R[−1]C+R[−2]C <RETURN>	enter the value mode
5	R21C3	F C :R22C3 <TAB> <TAB> $ <RETURN>	format the cells in the range to dollar sign format

2. Copy the balance from column 7 to column 5.
3. Blank the balance in column 7.

Now compare your screen to Table 6-6. See how easy it was?

LOGICAL OPERATIONS

The time sheet is very manageable and extremely powerful. Once the times have been entered, *Multiplan* handles all the calculations. Even someone with computer phobia will appreciate this application.

Using logical operations, we may make a souped-up time sheet. Companies usually pay employees overtime. Therefore it would be beneficial (and educational) to design a spreadsheet that calculates overtime pay. Suppose we want to add overtime for Penny Smith to our spreadsheet, as in Table 6-7.

The formula in Table 6-8 analyzes "Total_Hours." When the total number of hours is greater than forty, overtime is paid. Time-and-a-half is calculated and allotted for work done on overtime.

The logical formula is an *IF* statement with three parts. Each segment is separated by a comma.

sections
1 2 3
If (Question, yes, no)

The first segment is like a question. *Multiplan* examines the question and responds with a "yes" or "no" (true or false). In cells R21C3 and R22C3, we are asking if the total hours worked is greater than forty. If the total hours is greater than forty, then the answer is "yes;" if the total is forty or lower the answer is "no."

When the answer is "yes" *Multiplan* displays the value from part two of the IF statement. The value may be a number, a formula, or even a line of text enclosed in quotes. If the answer is "no," *Multiplan* displays the value in part three. In the

above examples Total_Hours was greater than 40, hence the answer was "yes." This prompted calculations in part two.

USING THE WINDOW COMMAND

Until now the spreadsheets we have designed have been fairly tame. All of the important information could be viewed at one time on the computer screen. But the *Multiplan* spreadsheet is like the Milky Way; it has 254 rows and 63 columns. Only a small fraction of the sheet may be seen at one time. The Window command gives a better perspective of the sheet by enabling us to see many separate parts at the same time (Fig. 6-1).

Before we actually use the window command, the time sheet should be expanded. It would be convenient to keep track of this person's weekly income and weekly donations to the needy governmental institutions. Later, these figures will be tied into a general payroll ledger.

Add the titles and values to our timecard that are shown in Table 6-9, using the coding in Table 6-10.

OPENING WINDOWS

The *Multiplan* screen cannot accommodate all the entries at one time. There comes a point when the column headings are no longer visible. Entering data into columns without headings to guide us is confusing. The totals at the bottom of the column may even seem meaningless. This is a job for the Window command. Choose it, and *Multiplan* will offer you some choices.

WINDOW: Split Border Close Link
Select Option or type command letter

We want to split the screen in two. Two halves will enable us to see two separate parts of the screen at one time. Drive the cursor to within five rows of the top border of the screen. Hatchet the screen there with the split command. *Multiplan* acknowledges your request with:

WINDOW SPLIT: Horizontal Vertical Titles
Select Option or type command letter

Horizontal will split the screen horizontally; Vertical, similarly, will split the screen vertically. Ax the screen horizontally. This will give you the power to see the titles no matter which region of the

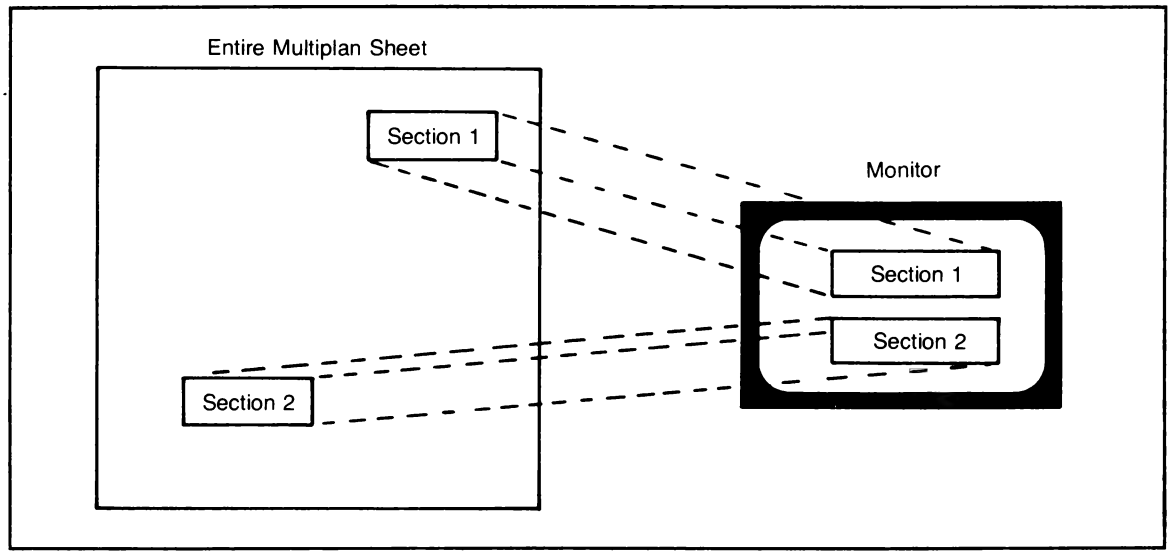


Fig. 6-1. Viewing two separate sections of the spreadsheet simultaneously.

Table 6-9. Spreadsheet with the Additions to Timecard Required.

	1	2	3	4	5	6	7	8	9	10
1	Employee Time Card:	Designed Oct, 1983								
2										
3	Date:									
4	Employee: Penny Smith									
5										
6		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday		
7	Hour In	9	9	10	9	10	10			
8	Minute In	5	12	24	7	15	30			
9	Hour Out	12	12	12	12	12	13			
10	Minute Out	1	3	2	0	1	30			
11	Hour In	12	13	12	13	12				
12	Minute In	59	0	58	1	59				
13	Hour Out	17	18	17	19	18				
14	Minute Out	45	30	51	15	12				
15										
16	Days Hours	7.70	8.35	6.52	9.12	6.98	3.00	0.00		
17										
18	Total Hours Worked for Week			41.67	Wage/hr	$8.35				
19										
20		Total Pay	$354.88		Take Home	$220.02				
21		Normal	$334.00		Fica	$23.78				
22		Overtime	$20.88		Fed Tax	$60.33				
23					State Tax	$39.04				
24					City Tax	$11.71				
25										
26										
27	Date	Weeks Pay	Take Home	Fica	Fed Tax	State Tax	City Tax		Normal	Overtime
28	---	---	---	---	---	---	---	---	---	---
29	Jan 7									
30	Jan 14									
31	Jan 21									
32	Jan 28									
33	Feb 4									
34	Feb 11									
35	Feb 18									
36	Feb 25									
37	Mar 4									
38	Mar 11									
39	Mar 18									
40	Mar 25									
41	Apr 1									
42	Apr 8									
43	Apr 15									

Table 6-9. Spreadsheet with the Additions to Timecard Required (continued from page 49).

44	Apr 22							
45	Apr 29	$354.88	$220.02	$23.78	$60.33	$39.04	$11.71	$334.00	$20.88
46	May 6	$334.00	$199.15	$22.38	$56.78	$36.74	$11.02	$334.00	$0.00
47	May 13	$300.60	$165.75	$20.14	$51.10	$33.07	$9.92	$300.60	$0.00
48	May 20	$400.80	$265.95	$26.85	$68.14	$44.09	$13.23	$334.00	$66.80
49									
50									
51	----------totals----------								
52									
53									
54		$1,390.28	$850.87	$93.15	$236.35	$152.93	$45.88	$1,302.60	$87.68

spreadsheet you are in. *Multiplan* has one more matter to settle:

WINDOW SPLIT HORIZONTAL at row: 32 linked: Yes(No)

Enter a number

The row number is the location where the screen will be divided. If the number on your screen is not correct, alter it.

"Linked" pertains to the scrolling of the two windows. Unlinked windows scroll independently of each other. Movement on one screen will not affect movement on the other. Linked screens will scroll in tandom. Moving downwards on a vertically split sheet will move both windows downwards. Under either selection, data entered into one window will affect the other windows. This happens because we are merely seeing different parts of a single sheet. At this time you want the screens to remain unlinked. Press the return key to finalize all of your decisions.

Now you may look at the screen from two different perspectives. You may move around in either window with the arrow keys or the GOTO command. To migrate from one sheet to the other, type the ;. The semicolon is a passport that enables you to skip across the border.

A good analogy compares split screens to security centers in large office buildings. An office building may be gigantic. It is impossible to see everything that goes on in the building; therefore, security can be a grave problem. One solution is to install a number of closed circuit TV cameras. The cameras monitor vulnerable spaces of the building and relay the picture to one central security station. At the security station there is a bank of TV monitors that a guard may scrutinize. In this manner the guard is able to observe the goings on in many secluded locations of the building. Likewise the Window command enables you to simultaneously view many isolated positions on the spreadsheet.

Center the titles in the top screen, then migrate to the bottom screen. You now may continue to enter data. When you are at the last line you may use a separate window to review the weeks pay breakdown (R20C2:R24C6). These numbers may be placed under the appropriate week.

CLOSING WINDOWS

The Close Window command will return the spreadsheet to its natural uncut beauty. To achieve unity enter the Window command, *Multiplan* will display:

WINDOW: Split Border Close Link
Select option or type command letter

Go for the Close option. Multiplan explores further:

WINDOW CLOSE window number: 2
Enter a number

Table 6-10. Coding for Additions to Timecard.

	Coord.	Commands/Formulas	Explanation
1	R27C2	F	format
		C	the cells
		:R27C10	in the range R27C2:R27C10
		<TAB>	
		C <RETURN>	to center alignment
2	R28C1	A	enter the alpha mode
		----------	type in ten dashes
		<RETURN>	
3	R28C1	C	copy the dashes
		R	to the right
		9 <RETURN>	nine columns
4	R29C2	F	format
		C	the cells
		:R54C10	in the range R29C2:R54C10
		<TAB> <TAB>	
		$ <RETURN>	to dollar sign format
5	R51C1	A	enter the alpha mode
		----------	type in ten dashes
		<RETURN>	
6	R51C1	C	copy the dashes
		R	to the right
		9 <RETURN>	nine cells

NOTE: If you follow the coding, *Multiplan* will offer 9 as a default setting for copy right.

7	R51C2	A	enter the alpha mode
		totals----	
		<RETURN>	
8	R54C2	V	enter the value mode
		sum(R[-25]C:R[-5])	use relative addressing
		<RETURN>	to sum the column
9	R54C2	C	copy the formula
		R	to the right
		8 <RETURN>	eight cells
10	R51C8	B <RETURN>	Blank the cell R51C8
11	enter the remaining titles		
12	enter figures in rows 29 to 48		

Check to see if the window number matches the number of the window you want to close. Change the number if needed. Initiate the splicing with the push of the return key.

Chapter 7

Working with Bigger and Better Spreadsheets

Your spreadsheet is beginning to resemble the national debt. It is getting bigger and bigger and more and more unmanageable. But there are ways to get your spreadsheet under control once again.

Multiplan recalculates the entire spreadsheet each time data is changed or entered on the spreadsheet. Small spreadsheets are recalculated faster than Clark Kent turns into the Man of Steel. Large spreadsheets, however, are slower than a city bus maneuvering through rush hour in downtown Manhattan. There are two ways to handle this.

The first method is to simply ask *Multiplan* to wait until all the new data has been entered into the spreadsheet. Once all the data is in, we can press a button, and *Multiplan* will recalculate the entire spreadsheet.

The second method requires you to divide overgrown spreadsheets into smaller offspring. The new family is then tied together with commands that transfer data from one spreadsheet to another. The eXternal command is enlisted to accomplish this. With the eXternal command several work sheets may tie together in a network.

Figure 7-1 illustrates the flow of data when the eXternal command is used. Spreadsheet A is feeding information to spreadsheet B. When spread sheet B is loaded (using the Transfer command), it reviews spreadsheet A. There are a group of numbers on spreadsheet A that B is interested in. B takes these numbers and incorporates them into its own sheet.

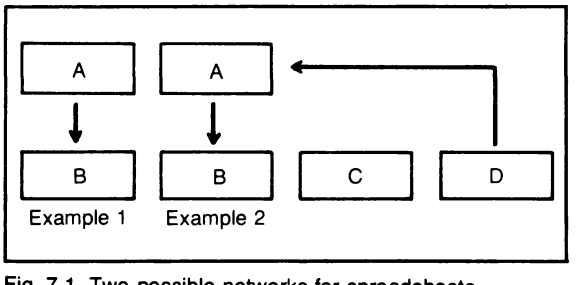


Fig. 7-1. Two possible networks for spreadsheets.

SETTING THE RECALCULATION OPTION

The first option is easy to operate and it packs a great deal of power. Gesture to *Multiplan* that you want to explore the Options for the work sheet (by

typing "O"). *Multiplan* responds to the wave of your hand with this display:

OPTIONS recalc: (Yes)No mute: Yes(No)
interation: Yes(No) completion test at:
Select Option

Switch the recalculation option to the off position (No). Now, you may continue to enter volumes of data into the computer without hassle, worry, or delay. When you want to tabulate the effects of the new data, type the *!* (using the shift key). *Multiplan* will pause to calculate all the new data. You may then punch in your next batch of data while *Multiplan* waits for further orders.

USING EXTERNAL COMMANDS

Just as you would not want to eat an unsliced pizza pie, you would not want to work with an oversized spreadsheet. EXternal commands give you the power to reduce massive spreadsheets to manageable bite size morsels. Large work sheets take eons for *Multiplan* to recalculate and are difficult to manipulate. In addition massive work sheets consume a large percentage of the computer's *random access memory* (RAM). Memory shortage is not a problem if you have a half-megabyte of RAM. Those, however, who have 64 K of RAM, will find that large spreadsheets approach the limits of their system.

EXternal commands enable you to integrate several spreadsheets. Football field sized work sheets may be separated into small interactive components. These components are stored on the disk drive until they are needed. If you have a virtual drive the components may be stored there. Floppy disks are an inexpensive means of storing mounds of information. A three-dollar disk may hold 360 K, or 360-thousand characters. The disadvantage of disks is that they are far slower than the RAM. But when your computer lacks the storage capacity in RAM, it is comforting to know there is a large open area on a disk where these component spreadsheets may be stored.

The timecards we designed earlier, were designed to calculate the employees pay for the week and to record past paychecks for income tax purposes. The timecard also computes the totals for each category of pay.

A payroll spreadsheet will keep track of these figures for each employee throughout the year. The spreadsheet will separate the amount that goes to government agencies from the amount that goes to employees. The work sheet will also analyze the ratio of overtime pay costs against regular pay costs.

We can integrate the timecards with the payroll spreadsheet and cost analysis work sheet using the eXternal command.

The first step is to name Penny Smith's pay totals. Name them "Penny_Smith." Save the modified spreadsheet before proceeding. Next start building the payroll spreadsheet before proceeding. Next start building the payroll spreadsheet according to the steps in Table 7-1 to produce the results shown in Table 7-2.

The figures for each employee are going to come from their personal spreadsheets. Initiate the eXternal command at coordinates R5C4. Curious *Multiplan* asks:

EXTERNAL: Copy List Use
Select option or type command letter

Reach for the copy option. Inquisitive *Multiplan* queries:

EXTERNAL COPY from sheet: name:
to: linked: (Yes)No
Enter filename

Multiplan needs the name of the contributing work sheet. In this scenario the name of the spreadsheet is "timecard." This is the sheet to copy from, so type that in the appropriate spaces. Next tell *Multiplan* the name of the group of data you are getting. The name of the information is Penny_Smith. *Multiplan* then needs the location of the cells that will receive this information. The coordinates are R5C4.

Last there is the link option. If the spread-

Table 7-1. Coding for Payrolls Spreadsheet. Remember to Use the Recalculation Option When Implementing the Spreadsheet.

	Coord.	Commands/Formulas	Explanation
1	R4C4	F	format
		C	the cells
		:R4C12	in the range R4C4:R4C12
		<TAB>	
		C <RETURN>	to center alignment
2	R5C4	F	format
		C	the cells
		:R9C12	in the range R5C4:R9C12
		<TAB> <TAB>	
		$ <RETURN>	to dollar sign format
3	R10C4	F	format
		C	the cells
		:R10C12	in the range R10C4:R10C12
		<TAB> <TAB>	
		%	to percentage format
		<TAB>	
		2 <RETURN>	with two decimal places
4	R9C4	V	set the value mode
		sum(R[-4]C:R[-1]C)	sum the column
		<RETURN>	
5	R9C4	C	copy the formula
		R	to the right
		8 <RETURN>	eight cells
6	R10C4	V	enter the value mode
		R[-1]C/R11C4	finds the percent of the
		<RETURN>	total pay of the factor
7	R10C4	C	copy the formula
		R	to the right
		8 <RETURN>	eight cells
8	R1C1	F	format
		C	the cells
		:R10C2	in the range R1C1:R10C2
		<TAB> <TAB>	
		C <RETURN>	to continuous format
9	R9C10	B	blank (erase) the cells
		:R10C10	in the range R9C10:R10C10
		<RETURN>	
10	Add the appropriate names and titles.		

sheets are not linked, the information will be transferred from Timecard to Payroll only once. The information will be moved upon hitting the return key. If the spreadsheets are linked, whenever you load Payroll the latest numbers under Penny_Smith will be placed on Payroll in the correct positions. This is the option you want since you want Multiplan to be able to automatically get the pertinent information for you.

The eXternal command is not that dramatic

Table 7-2. The Payrolls Spreadsheets without Data.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Payroll Ledger											
2												
3												
4	Last	First		Total Pay	Take Home	Fica	Fed Tax	State Tax	City Tax		Normal	Overtime
5	Smith	Penny										
6	Money	Jerry										
7	RockefelleJohn											
8	WestinghouGeorge											
9	Company Totals			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00		$0.00	$0.00
10	Percentage of Total			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!

Table 7-3. The Payrolls Spreadsheet with Data. A Separate Timecard for Each Employee is Not Necessary for Present Illustrative Purposes.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Payroll Ledger											
2												
3												
4	Last	First		Total Pay	Take Home	Fica	Fed Tax	State Tax	City Tax		Normal	Overtime
5	Smith	Penny		$1391.28	$851.87	$93.22	$236.52	$153.04	$45.91		$1303.60	$87.68
6	RockefelleMary			$1961.70	$1201.13	$131.43	$333.49	$215.79	$64.74		$1838.08	$123.62
7	Money	Jerry		$1362.78	$844.93	$91.31	$231.67	$149.90	$44.97		$1291.30	$63.48
8	RockefelleJohn			$2343.98	$1453.28	$157.05	$398.47	$257.83	$77.35		$2221.04	$109.19
9	WestinghouGeorge			$4617.64	$2862.96	$309.39	$784.99	$507.92	$152.38		$4375.44	$215.10
10	RockefelleDavid			$4386.76	$2719.81	$293.93	$745.74	$482.53	$144.76		$4156.67	$204.34
11	RockefelleJohn II			$7501.36	$4650.88	$502.61	$1275.22	$825.12	$247.54		$7107.90	$349.42
12	Carnegie	Andrew		$3324.70	$2061.33	$222.76	$565.19	$365.70	$109.71		$3150.32	$154.87
13	Company Totals			$26890.21	$16646.19	$1801.71	$4571.29	$2957.82	$887.35		$25444.34	$1307.69
14	Percentage of Total			100.00%	61.90%	6.70%	17.00%	11.00%	3.30%		94.62%	4.86%

right now because only one timecard is tied to the Payroll. To tie more timecards together you will have to make more of them. It is not necessary to build a new one. Simply make a copy of Timecard.

To make additional time sheets, load Timecard using the Transfer command. Then make the necessary changes on the spreadsheet. The employee name is different and the hours worked are different. When these alterations have been made, exercise the Transfer command to save the work sheet. This time, when operating the Save command, save the work sheet under a different name such as "Time1" (*Multiplan* only recognizes the first eight letters in a filename). Now you have two working copies of the spreadsheet. This method may be employed to create clones of any spreadsheet whenever you need them.

To reinforce what you have learned, try chaining a few more time sheets to Payroll. Eventually your Payroll work sheet will resemble the one in Table 7-3.

CHANGING THE COLUMN WIDTH

This new super spreadsheet is functionally fantastic. But, since good looks are a work sheet's best friend, you will want to spruce up this spreadsheet. There are two items that you might want to add to the spreadsheet to enhance its beauty—lines to separate titles from data and enlarged or reduced column widths to accommodate data.

Drawing lines is quite easy for the dexterous Multiplanner. First move to the space directly under the titles. Then insert a row (by typing *I*). Then enter the Alpha mode and fill one cell with a series of dashes ("----------"). To extend the line across the length of the spreadsheet, set the appropriate cells to continuous format. To add variety, requisition the equals sign to fashion lines ("=========="). Now that your work sheet is draped in all sorts of fineries, it should be fit for an international glamour show, much like the one in Table 7-4.

The next move in "operation facelift" is altering the column width. The last names of several employees have unfortunately been truncated. This disgrace may be corrected by allocating more space to the last name column. Put the format command into operation, and *Multiplan* will ask for further instructions:

FORMAT: Cells Default Options Width
Select option or type command letter

Enlist the width option to aid you in your task. *Multiplan* solicits additional information:

FORMAT WIDTH in chars or d(efault): d column: C through: C

Enter a number or d for default

The current setting is d(efault). The default width is 10 characters to a column. Replace the "d" with the number 14. Then indicate the columns the transmutation should apply to, column 1 through 1. Upon completion, your spreadsheet should look like the one in Table 7-5.

As a finishing touch you may wish to include a vertical line to separate the names from the numbers. First, reduce the column width of column three to three, the minimum width permitted. Place the ":" or "!" in the appropriate spaces and change the format alignment to center. Finally, add "–+", or "=+=" at the intersections. The finished product should appear as shown in Table 7-6.

Now you are ready for the International Art Fair in Paris. Get a letter quality printout on your NEC 1350 and catch the next flight to Europe.

MANAGING DATA WITH THE SORT COMMAND

Data management is to the computer industry what Black Jack is to Las Vegas. The computer's ability to manipulate large volumes of data quickly and efficiently is what makes the computer more popular than Walter Cronkite. When working with lists you frequently need to alphabetize. You may require a mailing list sorted alphabetically by last name or sorted by zip code. You may want to divide a customer list into those who are delinquent in their payments and those who have maintained

Table 7-4. Spreadsheet with Horizontal Lines Added.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Payroll Ledger											
2												
3												
4	Last	First		Total Pay	Take Home	Fica	Fed Tax	State Tax	City Tax		Normal	Overtime
5	---	---	---	---	---	---	---	---	---	---	---	---
6	Smith	Penny		$1391.28	$851.87	$93.22	$236.52	$153.04	$45.91		$1303.60	$87.68
7	Rockefelle	Mary		$1961.70	$1201.13	$131.43	$333.49	$215.79	$64.74		$1838.08	$123.62
8	Money	Jerry		$1362.78	$844.93	$91.31	$231.67	$149.90	$44.97		$1291.30	$63.48
9	Rockefelle	John		$2343.98	$1453.28	$157.05	$398.47	$257.83	$77.35		$2221.04	$109.19
10	Westinghou	George		$4617.64	$2862.96	$309.39	$784.99	$507.92	$152.38		$4375.44	$215.10
11	Rockefelle	David		$4386.76	$2719.81	$293.93	$745.74	$482.53	$144.76		$4156.67	$204.34
12	Rockefelle	John II		$7501.36	$4650.88	$502.61	$1275.22	$825.12	$247.54		$7107.90	$349.42
13	Carnegie	Andrew		$3324.70	$2061.33	$222.76	$565.19	$365.70	$109.71		$3150.32	$154.87
14	===	===	===	===	===	===	===	===	===	===	===	===
15	Company Totals			$26890.21	$16646.19	$1801.71	$4571.29	$2957.82	$887.35		$25444.34	$1307.69
16	Percentage of Total			100.00%	61.90%	6.70%	17.00%	11.00%	3.30%		94.62%	4.86%

Table 7-5. Spreadsheet with Modified Column Widths.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Payroll Ledger											
2												
3												
4	Last	First		Total Pay	Take Home	Fica	Fed Tax	State Tax	City Tax		Normal	Overtime
5	---	---	---	---	---	---	---	---	---	---	---	---
6	Smith	Penny		$1391.28	$851.87	$93.22	$236.52	$153.04	$45.91		$1303.60	$87.68
7	Rockefeller	Mary		$1961.70	$1201.13	$131.43	$333.49	$215.79	$64.74		$1838.08	$123.62
8	Money	Jerry		$1362.78	$844.93	$91.31	$231.67	$149.90	$44.97		$1291.30	$63.48
9	Rockefeller	John		$2343.98	$1453.28	$157.05	$398.47	$257.83	$77.35		$2221.04	$109.19
10	Westinghouse	George		$4617.64	$2862.96	$309.39	$784.99	$507.92	$152.38		$4375.44	$215.10
11	Rockefeller	David		$4386.76	$2719.81	$293.93	$745.74	$482.53	$144.76		$4156.67	$204.34
12	Rockefeller	John II		$7501.36	$4650.88	$502.61	$1275.22	$825.12	$247.54		$7107.90	$349.42
13	Carnegie	Andrew		$3324.70	$2061.33	$222.76	$565.19	$365.70	$109.71		$3150.32	$154.87
14	===	===	===	===	===	===	===	===	===	===	===	===
15	Company Totals			$26890.21	$16646.19	$1801.71	$4571.29	$2957.82	$887.35		$25444.34	$1307.69
16	Percentage of Total			100.00%	61.90%	6.70%	17.00%	11.00%	3.30%		94.62%	4.86%

Table 7-6. Spreadsheet with a Vertical Line Added.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Payroll Ledger											
2												
3			¦									
4	Last	First	¦	Total Pay	Take Home	Fica	Fed Tax	State Tax	City Tax		Normal	Overtime
5	----------	----------	+	----------	----------	----------	----------	----------	----------		----------	----------
6	Smith	Penny	¦	$1391.28	$851.87	$93.22	$236.52	$153.04	$45.91		$1303.60	$87.68
7	Rockefeller	Mary	¦	$1961.70	$1201.13	$131.43	$333.49	$215.79	$64.74		$1838.08	$123.62
8	Money	Jerry	¦	$1362.78	$844.93	$91.31	$231.67	$149.90	$44.97		$1291.30	$63.48
9	Rockefeller	John	¦	$2343.98	$1453.28	$157.05	$398.47	$257.83	$77.35		$2221.04	$109.19
10	Westinghouse	George	¦	$4617.64	$2862.96	$309.39	$784.99	$507.92	$152.38		$4375.44	$215.10
11	Rockefeller	David	¦	$4386.76	$2719.81	$293.93	$745.74	$482.53	$144.76		$4156.67	$204.34
12	Rockefeller	John II	¦	$7501.36	$4650.88	$502.61	$1275.22	$825.12	$247.54		$7107.90	$349.42
13	Carnegie	Andrew	¦	$3324.70	$2061.33	$222.76	$565.19	$365.70	$109.71		$3150.32	$154.87
14	==========	==========	+	==========	==========	==========	==========	==========	==========		==========	==========
15	Company Totals		¦	$26890.21	$16646.19	$1801.71	$4571.29	$2957.82	$887.35		$25444.34	$1307.69
16	Percentage of Total		¦	100.00%	61.90%	6.70%	17.00%	11.00%	3.30%		94.62%	4.86%

Table 7-7. Three Spreadsheets Illustrating the Step-by-Step Process Employed When Sorting by Two Fields.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Payroll Ledger											
2												
3			¦									
4	Last	First	¦	Total Pay	Take Home	Fica	Fed Tax	State Tax	City Tax		Normal	Overtime
5	----------	----------	+	----------	----------	----------	----------	----------	----------		----------	----------
6	Smith	Penny	¦	$1391.28	$851.87	$93.22	$236.52	$153.04	$45.91		$1303.60	$87.68
7	Rockefeller	Mary	¦	$1961.70	$1201.13	$131.43	$333.49	$215.79	$64.74		$1838.08	$123.62
8	Money	Jerry	¦	$1362.78	$844.93	$91.31	$231.67	$149.90	$44.97		$1291.30	$63.48
9	Rockefeller	John	¦	$2343.98	$1453.28	$157.05	$398.47	$257.83	$77.35		$2221.04	$109.19
10	Westinghouse	George	¦	$4617.64	$2862.96	$309.39	$784.99	$507.92	$152.38		$4375.44	$215.10
11	Rockefeller	David	¦	$4386.76	$2719.81	$293.93	$745.74	$482.53	$144.76		$4156.67	$204.34
12	Rockefeller	John II	¦	$7501.36	$4650.88	$502.61	$1275.22	$825.12	$247.54		$7107.90	$349.42
13	Carnegie	Andrew	¦	$3324.70	$2061.33	$222.76	$565.19	$365.70	$109.71		$3150.32	$154.87
14	==========	==========	+	==========	==========	==========	==========	==========	==========		==========	==========
15	Company Totals		¦	$26890.21	$16646.19	$1801.71	$4571.29	$2957.82	$887.35		$25444.34	$1307.69
16	Percentage of Total		¦	100.00%	61.90%	6.70%	17.00%	11.00%	3.30%		94.62%	4.86%

	1	2	3	4	5	6	7	8	9	10	11	12
1	Payroll Ledger											
2												
3												
4	Last	First		Total Pay	Take Home	Fica	Fed Tax	State Tax	City Tax		Normal	Overtime
5	---	---	---	---	---	---	---	---	---	---	---	---
6	Carnegie	Andrew		$3324.70	$2061.33	$222.76	$565.19	$365.70	$109.71		$3150.32	$154.87
7	Rockefeller	David		$4386.76	$2719.81	$293.93	$745.74	$482.53	$144.76		$4156.67	$204.34
8	Westinghouse	George		$4617.64	$2862.96	$309.39	$784.99	$507.92	$152.38		$4375.44	$215.10
9	Money	Jerry		$1362.78	$844.93	$91.31	$231.67	$149.90	$44.97		$1291.30	$63.48
10	Rockefeller	John		$2343.98	$1453.28	$157.05	$398.47	$257.83	$77.35		$2221.04	$109.19
11	Rockefeller	John II		$7501.36	$4650.88	$502.61	$1275.22	$825.12	$247.54		$7107.90	$349.42
12	Rockefeller	Mary		$1961.70	$1201.13	$131.43	$333.49	$215.79	$64.74		$1838.08	$123.62
13	Smith	Penny		$1391.28	$851.87	$93.22	$236.52	$153.04	$45.91		$1303.60	$87.68
14	===	===	===	===	===	===	===	===	===	===	===	===
15	Company Totals			$26890.21	$16646.19	$1801.71	$4571.29	$2957.82	$887.35		$25444.34	$1307.69
16	Percentage of Total			100.00%	61.90%	6.70%	17.00%	11.00%	3.30%		94.62%	4.86%

	1	2	3	4	5	6	7	8	9	10	11	12
1	Payroll Ledger											
2												
3												
4	Last	First		Total Pay	Take Home	Fica	Fed Tax	State Tax	City Tax		Normal	Overtime
5	---	---	---	---	---	---	---	---	---	---	---	---
6	Carnegie	Andrew		$3324.70	$2061.33	$222.76	$565.19	$365.70	$109.71		$3150.32	$154.87
7	Money	Jerry		$1362.78	$844.93	$91.31	$231.67	$149.90	$44.97		$1291.30	$63.48
8	Rockefeller	David		$4386.76	$2719.81	$293.93	$745.74	$482.53	$144.76		$4156.67	$204.34
9	Rockefeller	John		$2343.98	$1453.28	$157.05	$398.47	$257.83	$77.35		$2221.04	$109.19
10	Rockefeller	John II		$7501.36	$4650.88	$502.61	$1275.22	$825.12	$247.54		$7107.90	$349.42
11	Rockefeller	Mary		$1961.70	$1201.13	$131.43	$333.49	$215.79	$64.74		$1838.08	$123.62
12	Smith	Penny		$1391.28	$851.87	$93.22	$236.52	$153.04	$45.91		$1303.60	$87.68
13	Westinghouse	George		$4617.64	$2862.96	$309.39	$784.99	$507.92	$152.38		$4375.44	$215.10
14	===	===	===	===	===	===	===	===	===	===	===	===
15	Company Totals			$26890.21	$16646.19	$1801.71	$4571.29	$2957.82	$887.35		$25444.34	$1307.69
16	Percentage of Total			100.00%	61.90%	6.70%	17.00%	11.00%	3.30%		94.62%	4.86%

their credit. These operations may be accomplished quickly and efficiently with the Sort command.

It might be convenient to sort the payroll list by last name. Then when you need to find Andrew Carnegie's pay statistics, you do not have to eyeball the entire list until you stumble on his name. So, put the Sort command into operation. *Multiplan* offers the following parameters:

SORT by column: C between rows: 1 and: 255 order:(>)<

Enter a number

Notice that it is only possible to sort lists by columns. This should be remembered when designing spreadsheets. Careful consideration is always warranted before you design a work sheet. The first parameter to set is the column to be sorted. You are going to sort the list by column one. The next two parameters specify the rows to be affected. It is a good idea to include all the names between the borders and not to include the lines or the titles. The last parameter refers to ascending or descending order. In the ">"position names will be sorted from A to Z. At this point everything should be in position. Fire the return key and—Presto!—the list is sorted!

For further precision you may want to sort by last name and then by first name. Then all the Rockefeller's will be arranged alphabetically by first name. To get everything in order, sort the employees by first name. After this, sort the employees by last name. Table 7-7 shows the spreadsheet at these three different stages of development.

Whenever you wish to sort a list by multiple columns, first arrange the columns in the order of significance. Once this has been determined, take the least important factor and sort that first. Then take the second least important factor and sort that. Work your way up the list until you complete your task.

A final word about sorting. When you sort you may sabatoge the connections between some of your formulas. In the above example the formulas were not affected. Nevertheless, careful attention must be paid to sorting, otherwise formulas that refer to specific locations will be disturbed when the value they operate on is moved elsewhere. One way to partially overcome this difficulty is to turn off the automatic recalculation. Of course the best way to handle this dilemma is to plan carefully and thoroughly at the work sheet's inception.

Chapter 8

Managing a Stock Portfolio

By now you should be an old hand at *Multiplan*. We have covered all the concepts. Now it will be much easier for you to assimilate new commands. The following chapters present various *Multiplan* applications. You need not read them in any particular order. If there are any applications that pertain to your needs, you may proceed to them immediately. We encourage you to strike out on your own, to experiment, and to utilize *Multiplan* according to your own personal needs.

We do suggest, however, that you study the advanced commands in the following examples to gain additional experience with *Multiplan* and learn new techniques. You may also want to read over the summary of all the commands in Appendix B to see if any of the advanced commands interest you.

A spreadsheet provides an easy way to watch the performance of your portfolio. A spreadsheet enables you to follow the prices of stocks over a specific period of time. You may then compare past prices with current prices to aid in guessing the stock's future performance. The newspaper gives you the high and low of the stock for a 52-week period. You may be more precise than that, getting statistics for the last week, two weeks, month, or for whatever time period you choose. All the preparation you have to do is the entering of the stock prices.

THE MAX, MIN, AND AVERAGE FUNCTIONS

This spreadsheet is really divided into two work sheets that are linked by eXternal commands. The first work sheet is used to record stock closing prices, which may be pooled from the newspaper. This work sheet also performs some minor calculations, determining highs, lows, and averages for various periods. These figures are sent via eXternal commands to a second work sheet, which is designed to analyze your rate of return.

To begin with, construct the closing prices work sheet as shown in Table 8-1. And by all means, pick stocks that interest you.

Then you will need to determine the highs and lows for the listed periods. This process involves using two new commands, Max and Min. These formulas are similar to Sum, used in Chapter 4.

Table 8-1. The Stocks Spreadsheet.

	1	2	3	4	5	6
1	PORTFOLIO					
2						
3						
4	DATE	ChmNY	EXXON	GDy pfA	Gnl Fds	IBM
5	----------	----------	----------	----------	----------	----------
6	July 21	44.500	125.125	37.000	50.875	134.125
7	July 22	44.000	125.875	36.500	50.500	133.500
8	July 25	44.375	127.250	36.750	50.625	135.625
9	July 26	43.750	127.500	37.125	50.250	135.250
10	July 27	44.125	126.850	37.500	50.000	135.100
11	July 28	44.875	126.500	37.625	50.000	135.625
12	July 29	45.125	127.625	37.500	50.125	137.000
13	Aug 1	45.625	127.500	38.250	49.750	137.750
14	Aug 2	45.500	126.875	38.125	49.750	136.875
15	Aug 3	44.375	128.250	38.625	50.250	138.125
16	Aug 4	45.875	127.875	39.000	50.500	139.875
17	Aug 5	45.875	127.750	38.750	51.125	140.125
18	Aug 8	45.750	127.750	38.500	50.750	139.375
19	Aug 9	45.625	127.250	38.500	50.750	138.750
20	Aug 10	44.875	128.125	38.625	51.125	139.375
21	Aug 11	44.625	128.250	39.125	51.000	139.625
22	Aug 12	44.625	129.125	39.000	51.250	140.625
23	Aug 15	45.000	129.250	38.750	50.875	140.500
24	Aug 16	45.125	129.250	38.500	51.125	140.625
25	Aug 17	46.250	129.000	38.625	52.875	143.375
26	Aug 18	46.875	129.125	38.625	52.750	144.000
27	Aug 19	47.000	128.750	39.250	52.625	144.125
28	Aug 22	46.750	128.375	38.750	52.500	144.000
29	----------	----------	----------	----------	----------	----------
30	Closing	46.750	128.375	38.750	52.500	144.000
31						
32	Weeks High	47.000	129.250	39.250	52.875	144.125
33	Weeks Low	45.125	128.375	38.500	51.125	140.625
34	Weeks Avg	46.400	128.900	38.750	52.375	143.225
35	Pct Change	0.749%	-0.409%	0.000%	0.238%	0.538%
36						
37	2Week High	47.000	129.250	39.250	52.875	144.125
38	2Week Low	44.625	127.250	38.500	50.750	138.750
39	2Week Avg	45.675	128.650	38.775	51.688	141.500
40	Pct Change	2.299%	-0.214%	-0.065%	1.548%	1.736%
41						
42	Mnths High	47.000	129.250	39.250	52.875	144.125
43	Mnths Low	43.750	126.500	37.125	49.750	135.100
44	Mnths Avg	45.381	128.049	38.438	50.969	139.505
45	Pct Change	2.928%	0.254%	0.806%	2.917%	3.122%

To get the maximum value of a list, use "Max(list)." The list is indicated by a range of rows and columns.

The second step is to determine the average for the marked periods. This, too, may be done in a very straightforward manner. Find the correct coordinates, then place the formulas in Table 8-2 in those coordinates.

After this task has been completed the cells must be formatted and named. To enhance their visual appeal, the figures have been rounded to three decimal places. To accomplish this, set the format code to "fix" and the number of decimal places to three for the entire spreadsheet, which will change the default format. For the cells portraying percentage change, set the format code to Percent. Finally, name the important figures that will be transferred via eXternal commands to the master work sheet.

ADVANCED LOGICAL OPERATIONS

This offers a chance to sculpture some advanced logical functions. You were introduced to the IF function in Chapter 6 and there are two functions, AND and OR, which may be used in tandem with IF. Before using these functions it will be necessary to quickly explain Boolean algebra, but don't panic; it is all very logical.

In Boolean algebra there are only two possible results, true and false. Because there are only two possibilities, Boolean algebra is a very fundamental system. In the IF statement, the first part's value (true or false) determines whether the operation in the second or third part is performed. In the example below, if the principal is greater than ten thousand (part 1 is true), the rate will be set to 9.5%; in apposition, if the principal is less than ten thousand (part 1 is false) the rate will be set at .0525%.

```
                    sections
          1          2          3
If(Principal>10000,Rate=.095,Rate=.0525)
```

The AND and OR functions yield either a true or false result. They have individual sections. For example, the AND function might be incorporated as follows.

```
And (Principal>10000, YEARS>3)
```

The true/false value of the individual parts will determine the final true/false value of the entire statement.

With the AND statement both parts must be true for the entire statement to be true. For the OR statement, if either of the parts is true the entire statement will be true. Figure 8-1 shows two diagrams to illustrate the differences.

To further illustrate this advanced concept, Table 8-3 contains some short problems to experiment with on a separate electronic work sheet. Notice the values of the individual parts of each statement and the results of the total statements.

Multiplan can bring to our attention potentially interesting trends in data. For example, it can point out a stock that seems to be consistently losing money and bring it to our attention. In particular, the coding in Table 8-4 tells us which stocks have lost ground in the past three time periods.

The second spreadsheet will draw from the figures in Table 8-4. Calculations will be performed on them according to the number of shares an individual owns and the initial amount paid for the stocks. Construct the framework according to the diagram; afterwards we will design the infrastructure. When your second spreadsheet looks like the one in Table 8-5, you are ready to proceed.

Notice the rationale that went into designing this system. The first spreadsheet is devoted mostly to accumulation of data. It passes values derived from the data to a second work sheet. The second work sheet calculates and analyzes the results. This system is faster and has more room for expansion than a system using only one spreadsheet.

X	Y	Or (X,Y)
T	T	T
T	F	T
F	T	T
F	F	F

X	Y	And (X,Y)
T	T	T
T	F	F
F	T	F
F	F	F

Fig. 8-1. Tables illustrating results of Boolean expressions.

Table 8-2. Coding for Stocks Spreadsheet.

	Coord.	Commands/Formulas	Explanation
1		enter all dates and titles enter all data (data is in rows 6 to 28	
2		draw lines	
3	R30C2	V R[−2]C <RETURN>	enter the value mode enter formula
4	R32C2	V MAX(R[−4]C:R[−8]C) <RETURN>	enter the value mode enter the formula
5	R33C2	V MIN(R[−5]C:R[−9[C) <RETURN>	
6	R34C2	V AVERAGE(R[−6]C:R[−10]C) <RETURN>	
7	R35C2	1−R[−1]C/R[−5]C <RETURN>	
8	R37C2	V MAX(R[−9]C:R[−18]C) <RETURN>	
9	R38C2	V MIN(R[−10]C:R[−19]C) <RETURN>	
10	R39C2	V AVERAGE(R[−11]C:R[−20]C) <RETURN>	
11	R40C2	1−R[−1]C/R[−10]C <RETURN>	
12	R42C2	V MAX(R[−14]C:R[−33]C) <RETURN>	
13	R43C2	V MIN(R[−15]C:R[−34]C) <RETURN>	
14	R44C2	V AVERAGE(R[−16]C:R[−35]C) <RETURN>	
15	R45C2	1−R[−1]C/R[−15]C <RETURN>	

	Coord.	Commands/Formulas	Explanation
16	R30C2	C	copy
		R	to the right
		4	cells
		<TAB>	from the range
		:R45C2 <RETURN>	R30C2:R45C2
17	R4C2	F	format
		C	the cells
		:R4C6	in the range R4C2:R4C6
		<TAB>	
		C<RETURN>	to center alignment
18	R6C2	F	format
		C	the cells
		:R45C6	in the range R6C2:R45C6
		<TAB> <TAB>	
		F	to fixed decimals
		<TAB>	
		3 <RETURN>	with three decimal places
19	R35C2	F	format
		C	the cells
		:R35C6	in the range R35C2:R35C6
		<TAB> <TAB>	
		%	to percent format
		<TAB>	
		3	with three decimal places
20	R40C2	F	format
		C	the cells
		:R40C6	in the range R40C2:R40C6
		<TAB> <TAB>	
		%	to percent format
		<<TAB>	
		3 <RETURN>	with three decimal places
21	R45C2	F	format
		C	the cells
		:R45C6	in the range R45C2:R45C6
		<TAB> <TAB>	
		%	to percent format
		<TAB>	
		3 <RETURN>	with three decimal places
22	R30C2	N	name the cell
		Closing <TAB>	Closing
		:R30C6 <RETURN>	in the range R30C2:R30C6
23	R35C2	N	name the cells
		Weeks_Change	Weeks_Change
		<RETURN>	in the range R35C2:R35C6
24	R40C2	N	name the cells
		Week2_Change	Week2_Change
		<RETURN>	in the range R40C2:R40C6
25	R45C2	N	name the cells
		Months_Change	Months_Change
		<RETURN>	in the range R45C2:R45C6

LOCKING UP YOUR VALUABLE INFORMATION

If you work in an office environment, it is quite likely that other people will be using your spreadsheets. They may also be computer neophytes, and their lack of knowledge may result in the destruction of your work sheet. One way to prevent such accidents is to fly in the National Guard. They may then watch over your disk box 24-hours a day. A more subtle method is to secure data and formulas with the Lock command. Lock prevents accidental changes and erasures of data on the spreadsheet.

Let's try the Lock command on the main command level.

LOCK: Cells Formulas
Select option or type command letter

Lock Formulas will lock all the cells with text and formulas. Lock Cells will lock or unlock a family of cells that you specify. Taking the stocks data work sheet, use the Lock Cells to lock all the entries. Move to the upper right-hand corner, and type "L." *Multiplan* asks for the parameters:

LOCK cells: R1C1 status: Locked (Unlocked)
Enter reference to cell or group of cells

Indicate that you wish to secure all the entries

Table 8-3. Coding to Practice with Boolean Expressions.

	Coord.	Commands/Formulas	Results
1		enter titles in column 1	
2		enter numbers in column 2	
3	R4C1	F W 15 <RETURN>	format the column width to fifteen characters
4	R12C2	V R[−6]C<0 <RETURN>	if the percentage change in a week is negative (less than zero) returns the value TRUE.
5	R13C2	V AND(R[−7]C<0,R[−6]C<0) <RETURN>	checks if change for week and month is negative, returns the value TRUE.
6	R14C2	V AND(R[−7]C<0,R[−6]C<0, R[−5]C<0) <RETURN>	checks if change for week, month, and year is negative, returns the value FALSE.
7	R16C2	V OR(R[−5]C,R[−12]C<R[−11]C) <RETURN>	checks if either the weeks change was negative or if the closing price was higher than the purchase price, returns the value TRUE.

Table 8-4. Coding for the Second Spreadsheet to which Stocks Will Be Attached.

	Coord.	Commands/Formulas	Explanation
1		add titles	
2		add lines	
3		add dates	use the alpha command
4		add purchase prices	
5		add number of shares	
6	R9C2	X C stocks <TAB> Closing <TAB> :R9C6 <RETURN>	initiate eXternal copy command copy from the spreadsheet stocks and the line Closing to the range R9C2:R9C6
7	R10C2	X C <TAB> Weeks_Change <RETURN>	initiate eXternal copy command copy from stocks and the line Weeks_Change to the range R10C2:R10C6
8	R11C2	X C <TAB> Week2_Change <RETURN>	initiate eXternal copy command copy from stocks and the line Week2_Change to the range R11C2:R11C6
9	R12C2	X C <TAB> Months_Change <RETURN>	initiate eXternal copy command copy from stocks and the line Months_Change to the range R12C2:R12C6
10	R15C2	V R[−7]C*R[−6]C <RETURN>	enter a formula
11	R16C2	V IF(OR(AND(R[−6]C<0, R[−5]C<0),R[−4]C<0), "losses","") <RETURN>	if either the stock value has declined in the last week and last month or the stock price is less than the purchase price, print "losses"
12	R17C2	V IF(OR(R[−7]C>3%,R [−6] C>3%, R[−5]C >3%), "gains","") <RETURN>	if the stock value has increased by more than three percent during the week, or the month, or the year, print "gains"
13	R15C2	C R 4 :R17C2 <RETURN>	copy to the right four cells from the range R15C2:R17C2
14	R19C2	V SUM(R[−4]C:R[−4]C[+4]) <RETURN>	the sum of the value of stocks held

Table 8-5. The Second Spreadsheet to which the Stocks Spreadsheet Will Be Attached.

	1	2	3	4	5	6
1	PORTFOLIO					
2						
3						
4		ChmNY	EXXON	GDy pfA	Gnl Fds	IBM
5	----------	----------	----------	----------	----------	----------
6	Date Purchased	04/15/83	12/22/82	01/28/83	09/26/83	06/01/83
7	Purchase Price	$42.25	$115.88	$41.38	$49.50	$127.13
8	Number of Shares	300	150	200	100	200
9	Closing	$46.75	$128.38	$38.75	$52.50	$144.00
10	Weeks Change	0.749%	-0.409%	0.000%	0.238%	0.538%
11	Two Week Change	2.299%	-0.214%	-0.065%	1.548%	1.736%
12	Months Change	2.928%	0.254%	0.806%	2.917%	3.122%
13	----------	----------	----------	----------	----------	----------
14						
15	Value of Holdings	$14025.00	$19256.25	$7750.00	$5250.00	$28800.00
16	Unusual Losses		losses			
17	Unusual Gains					gains
18						
19	Total Holdings	$75081.25				

from R1C1:R28C6 and switch the status to Locked. The Lock command is effective against the following commands—Alpha, Blank, Copy, Edit, Value, and eXternal. The cells may still be moved around. This allows you to insert additional rows when updating your report.

In future applications you should leave cells with dynamic data unlocked. For example, on the timecard in Chapter 6, it was necessary to enter the time in and time out for each day of the week. These numbers need to be modified each week, so the cells should be left unlocked. However, the titles on the spreadsheet are fixed. Hence they should be locked. Safeguarding your cells is always wise. It will even protect you from your own careless (yet devastating!) errors.

Chapter 9

Setting Up a Simple Accounting System

Maintaining accurate accounts is essential not only for businesses but for individuals. Accurate accounts are important for filing tax returns, determining budgets, and collecting outstanding debts. *Multiplan* provides an excellent way of handling a small-scale accounting system. Data may be organized neatly in various columns. The totals may be calculated quickly and accurately, and credits and debits may be reviewed painlessly with the Sort command. If your business warrants it, your accounting spreadsheet may be connected to other financial work sheets.

The framework of the spreadsheet should be constructed per the instructions in Table 9-1. You may want to adapt the columns to fit the specific needs of your company.

Table 9-2 is an example of a rudimentary accounting system designed for a small business. The first four columns are designed to register different sources of income. Columns one and two are allocated to income acquired for services performed, and are divided into cash and checks. The third column records any proceeds that come from sales. The fourth column is included for miscellaneous income, such as awards, gifts, interest from loans, and stock dividends. Additional columns may be added for other monetary gains.

The date of each transaction is chronicled in the fifth column with the name of the account inscribed in the seventh column and a short description of the exchange in the neighboring column in between the sixth.

In the eighth and ninth columns, a summary of all cash transactions is maintained. The eighth lists cash receipts. The ninth contains all cash payments.

Columns ten through thirteen integrate the checking account. The tenth column is for deposits made. The next two are used to document payments via check. Both the check number and the check amount are written down. Column thirteen retains the checking account balance.

The fourteenth column is used to keep track of money credited to you. Sums your clients owe are

Table 9-1. Outline of the Accounts Spreadsheet.

	1	2	3	4	5	6	7	8	9
1									
2		income							
3	services							cash	
4	cash	checks	sales	misc	date	description	account name	receipts	payments
5	---	---	---	---	---	---	---	---	---
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21	---	---	---	---	---	---	---	---	---
22	$0.00	$0.00	$0.00	$0.00				$0.00	$0.00

documented here. This enables you to quickly access those accounts that have yet to be settled.

Subsequent columns are enlisted to record various expenses. Some subdivisions have been suggested, but they may be amended according to your needs.

At the bottom of the sheet, totals are kept for the appropriate columns. These numbers will eventually be included in a monthly report and an end of the year statement.

The data in Table 9-3 are suggested as entries to experiment with the accounting system.

Once the data has been entered you may want to manipulate it. A likely scenario is as follows: it is the middle of September, and you want to find individuals that have not settled their bills for August. In front of you is August's work sheet. You may use the Sort command on column fourteen. All the rows containing figures will appear on top. These are the individuals who are in debt. You may send bills to each member.

In a second scenario, Ralph's Garage Service sends a notice stating that you have not paid for a $50 tune up on one of the company's cars on August 12. You want to quickly find all the records of payments made to Ralph's Garage Service. You request that omniscient *Multiplan* sort the list according to account title. After ordering this, you quickly check all the titles beginning with R. Under one of the entries is Ralph's Garage Service. The date under the entry is August 14 and the amount is for $50. Although the date does not match, it is probably a result of human error. You call Ralph's Garage Service to ask him to recheck his accounts and then humbly suggest that he purchase *Multiplan*.

THE YEARLY REPORT

A master spreadsheet to list the totals for each month will complete our creation. Figures for each month will be transferred from the appropriate monthly spreadsheet to the yearly spreadsheet. The yearly spreadsheet may then be used to estimate the amount that will be needed to pay income taxes. Handling this task requires the use of the Count function and the Lookup function.

10	11	12	13	14	15	16	17	18	19
	checking account						expenses		
deposits	payment	check #	balance	credits	stationary	postage	phone	rent&util	misc
$0.00	$0.00			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Arrange the yearly report in the style of Table 9-4 following the coding in Table 9-5.

The work sheet is constructed in a very sensible manner. Totals are taken from corresponding columns in the month's accounts reports. Total income is calculated from the first four columns. The total expenses are a tabulation of all the expenses. And the checkbook balance figures come directly from the monthly reports.

THE COUNT FUNCTION

There is one subtle function that makes this spreadsheet a diamond. Good planners allocate a certain percentage of their income to paying Uncle Sam when April comes around. This spreadsheet will estimate your yearly income, and then suggest how much you should save for April's annual ritual. This process involves counting the number of months reported, determining the total year's income to date, and then using these two figures to estimate your annual income.

To estimate annual income, it is necessary to ascertain how many months of the year have elapsed. If we know how many months have elapsed, we may estimate the annual income by finding the average monthly income and multiplying this figure by twelve.

One method would be to ask the user for the month's number, but the more tasks that can be automated, the fewer the opportunities for operator error, and the faster the spreadsheet may be updated. The function count returns the number of values in a list. The typical format for the command rests below:

COUNT(LIST)

The list is the range of values to be counted. The coding to append to the Accounts spreadsheet is shown in Table 9-6. The results are shown in Table 9-7.

The formula at R16C10 returns the number of months. The total income for the year is divided by this number (at R19C4).

Then this number is multiplied by 12 to yield the estimated annual income (at R21C4). Finally,

Table 9-2. Coding for the Accounts Spreadsheet.

Coord.	Commands/Formulas	Explanation
1	enter titles	
2	set up lines	
3 R1C1	F	format
	C	the cells
	:R3C19	in the range R1C1:R3C19
	<TAB>	to
	R	right-justified alignment
	<TAB>	and
	C <RETURN>	continuous format
4 R4C1	F	format
	C	the cells
	:19	in the range R4C1:R4C19
	<TAB>	(this is a more efficient way to define ranges)
	C <RETURN>	to centered alignment
5 R4C6	F	change (format)
	W	the column width
	20	to twenty characters
	<TAB>	for
	6	column 6
	<TAB>	through
	7 <RETURN>	column 7
6 R6C1	F	format
	C	the cells
	:R22C11	in the range R6C1:R22C11
	<TAB> <TAB>	
	$ <RETURN>	to dollar sign format
7 R13C6	F	format
	C	the cells
	:R22C19	in the range R13C6:R22C19
	<TAB> <TAB>	to
	$ <RETURN>	dollar sign format
8 R22C1	V	set up a formula to sum
	SUM(R[-2]C:R[-16]C)	of the column
	<RETURN>	
9 R22C1	C	copy the formula
	R	to the right
	18 <RETURN>	18 cells
10 R22C5	B	erase (blank) the cells
	:7 <RETURN>	in the range R22C5:R22C7
11 R22C12	B	erase (blank) the cells
	:13 <RETURN>	in the range R22C12:R22C13
12 R22C1	N	name the cells in preparation for an eXternal link
	Aug_income	call the cells August income
	:4 <RETURN>	in the range R22C1:R22C4
13 R22C8	N	name the cells in preparation for an eXternal link
	Aug_accounts	call the cells August accounts
	:11 <RETURN>	in the range R22C8:R22C11
14 R22C14	N	name the cells in preparation for an eXternal link
	Aug_expenses	call the cells August expenses
	:19 <RETURN>	in the range R22C14:R22C19

the estimated annual income is given to the lookup table.

EXPLAINING THE LOOKUP FUNCTION

A lookup table is useful in more applications than there are pocket calculators in the world. A lookup table may be enlisted to determine a tax rate after an annual income is calculated. Or it may be administered to offer a discount when a number of goods are ordered. A lookup table is useful when normal mathematical formulas will not return the proper rates. Read the explanation below carefully.

The lookup function is divided into two parts.

LOOKUP(N,Table)

"N" represents a number. In this scenario, it portrays the quantity of disks ordered. "Table" represents the coordinates of a group of cells. The following offers a compelling demonstration.

Multiplan takes "N"and looks in the first column of tables for the first number greater than "N." When it finds this value, it goes back to the preceding number and returns the entry matched to this number. If a number greater than "N" is not found in the table, the last number in the table is returned. To elucidate the function let's work with the small lookup table shown in Table 9-9. You may set up such a table following the coding in Table 9-8.

Let's say a customer ordered twenty disks. *Multiplan* would run down the list of quantity ordered until it reached fifty. Fifty is the first value greater than twenty, the number of disks being ordered. *Multiplan* then proceeds to take one step backwards and moves to ten. *Multiplan* then takes the figure 5% and returns it to the cell where the lookup function is. The value can then be used to calculate the final price for the order of disks.

The table saves an employee from rummaging through a stack of papers to find the quantity discounts for disk orders. Any computer jock will know how important disks are. This table was simple and straightforward, and illustrates just one of many applications of lookup tables. Practice entering different data. Also experiment with the command before incorporating it into the accounting system you are building.

EMPLOYING LOOKUP TABLES

Once *Multiplan* has approximated your income, it uses a lookup table to determine the tax rate you will suffer from. In Chapter 6, we manually entered the tax rate. We may now replace that method with a far more sophisticated one—the lookup table.

Now the lookup table should be constructed following the diagram in Table 9-10 below and the coding in Table 9-11.

This lookup table supplies the federal income tax rate. It may be expanded to offer tax rates for state and city institutions and more accurate federal tax rates. These rates will vary considerably from state to state and city to city. The coding documents the necessary additions.

Notice how the Lookup command functions. The number is always compared with the values in the first column of the table indicated. The figure returned is always in the last column of the table specified.

Table 9-3. Picture of the Completed Accounts Spreadsheet.

	1	2	3	4	5	6	7	8
1								
2		income						
3	services							cash
4	cash	checks	sales	misc	date	description	account name	receipts
5	---	---	---	---	---	---	---	---
6								
7	$40.00				Aug 2	consulting 1 hr	Littletown HS	$40.00
8					Aug 3	gas	Ralph's Garage	
9		$125.00			Aug 5	repair disk drive	Howard Aiken	
10					Aug 7	transfer		
11					Aug 7	two week pay	Richard Babbage	
12					Aug 8	July's rent	Central Realty	
13	$40.00				Aug 12	tutoring 1 hr	Anne Hope	$40.00
14					Aug 14	tune up	Ralph's Garage	
15			$35.75		Aug 15	Maxell DSDD 5 inch	Harry Lewis	
16					Aug 17	July's phone bill	MCI	
17					Aug 18	envelopes, folders,	Bob Slate	
18			$625.00		Aug 20	Epson FX-80 w/paper	Anne Hope	
19		$550.00			Aug 21	Programming	Central Bank	
20					Aug 23	Express Mail	US Post Office	
21	---	---	---	---	---	---	---	---
22	$80.00	$675.00	$660.75	$0.00				$80.00

Table 9-4. Diagram of the Yearly Report.

	1	2	3	4	5	6	7	8
1								
2			income			transactions		
3		services				cash account		checking
4	month	cash	check	sales	misc	receipts	payments	deposits
5	---	---	---	---	---	---	---	---
6								
7	August	$80.00	$675.00	$660.75	$0.00	$80.00	$51.35	$1240.75
8	September	$325.00	$1325.78	$1245.38	$0.00	$325.00	$328.80	$2691.16
9								
10								
11								
12	---	---	---	---	---	---	---	---
13		$405.00	$2000.78	$1906.13	$0.00	$405.00	$380.15	$3931.91
14								
15								
16		Total Income		$4311.91				
17		Total Expenses		$3418.24				
18		Net Income		$893.67				

9	10	11	12	13	14	15	16	17	18	19
		checking account						expenses		
payments	deposits	payment	check #	balance	credits	stationary	postage	phone	rent&util	misc
				$2132.27						
				$2132.27						
$12.00				$2132.27						$12.00
				$2132.27	$125.00					
$30.00	$30.00			$2162.27						
		$525.00	327	$1637.27						$525.00
		$1322.97	328	$314.30					$1322.97	
				$314.30						
		$50.00	329	$264.30						$50.00
	$35.75			$300.05						
		$78.37	330	$221.68				$78.37		
		$12.15	331	$209.53		$12.15				
	$625.00			$834.53						
	$550.00			$1384.53						
$9.35				$1384.53			$9.35			
$51.35	$1240.75	$1988.49			$125.00	$12.15	$9.35	$78.37	$1322.97	$587.00

9	10	11	12	13	14	15
account				expenses		
payments	balance	stationary	postage	phone	rent&util	misc
	$1375.40					
$1988.49	$627.66	$12.15	$9.35	$78.37	$1322.97	$587.00
$1404.60	$1914.22	$7.82	$3.80	$98.22	$1298.56	$0.00
	$1914.22					
	$1914.22					
	$1914.22					
$3393.09	$1914.22	$19.97	$13.15	$176.59	$2621.53	$587.00

Table 9-5. Coding for the Yearly Report.

Coord.	Commands/Formulas	Explanation
1	enter titles	
2	format titles	
3	set up lines	
4 R6C10	1375.40 <RETURN>	the opening balance for the checking account
5 R7C2	X C Aug <TAB> Aug_income <RETURN>	eXternal copy from the spreadsheet named Aug and the cells named Aug_income
6 R7C6	X C <TAB> Aug_transactions <RETURN>	eXternal copy from the spreadsheet named Aug and the cells named Aug_transactions
7 R7C11	X C <TAB> Aug_expenses <RETURN>	eXternal copy from the spreadsheet named Aug and the cells named Aug_expenses
8 R7C10	V R[-1[C+RC[-2]-[<RETURN>	set up a formula to calculate the checkbook balance
9 R7C10	C D 4 <RETURN>	copy the formula downwards four cells
10 R13C2	V SUM(R[-6]C:R[-2]C) <RETURN>	set up a formula to calculate the sum of the columns
11 R13C2	C R 13 <RETURN>	copy the formula to the right thirteen cells
12 R13C10	V R[-2]C <RETURN>	the balance is equal to the last balance calculated
13 R16C4	V SUM(R[-3]C[-2]:R[-3]C[+1]) <RETURN>	the sum of the four income categories
14 R17C4	V SUM(R[-4]C[+7]:R[-4]C[+11]) <RETURN>	the sum of the five expenses categories
15 R18C4	V R[-2]C-R[-1]C <RETURN>	income minus expenses

Table 9-6. Additions to Estimate Yearly Income and Income Taxes.

Coord.	Commands/Formulas	Explanation
1	enter titles, Monthly Net Income, Est Annual Income, and Months Elapsed.	
2	format titles appropriately	
3	format data appropriately	
4 R16C9	V COUNT(R[-5]C:R[-9]C) <RETURN>	enter a formula to count the number of numeric entries in a specific range
5 R19C4	V R[-1]C/R[-3]C[+5] <RETURN>	calculate the average monthly net income
6 R21C4	12*R[-2]C <RETURN>	multiply the average monthly net income by twelve to get the estimated yearly income

Table 9-7. Spreadsheet Incorporating the Additions.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1															
2			income				transactions								
3		services				cash account		checking account					expenses		
4	month	cash	check	sales	misc	receipts	payments	deposits	payments	balance	stationary	postage	phone	rent&util	misc
5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6										$1375.40					
7	August	$80.00	$675.00	$660.75	$0.00	$80.00	$51.35	$1240.75	$1988.49	$627.66	$12.15	$9.35	$78.37	$1322.97	$587.00
8	September	$325.00	$1325.78	$1245.38	$0.00	$325.00	$328.80	$2691.16	$1404.60	$1914.22	$7.82	$3.80	$98.22	$1298.56	$0.00
9									-	$1914.22					
10										$1914.22					
11										$1914.22					
12	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13		$405.00	$2000.78	$1906.13	$0.00	$405.00	$380.15	$3931.91	$3393.09	$1914.22	$19.97	$13.15	$176.59	$2621.53	$587.00
14															
15															
16		Total Income		$4311.91			Months Elapsed		2						
17		Total Expenses		$3418.24											
18		Net Income		$893.67											
19		Monthly Net Income		$446.84											
20															
21		Est Annual Income		$5362.02											

Table 9-8. Coding for an Elementary Lookup Table.

	Coord.	Commands/Formulas	Explanation
1		enter titles	
2		format titles	
3		set up lines	
4		enter data	
5	R5C4	V LOOKUP(R3C4,R[+6]C[−2]: R[+13]C[−1]) <RETURN>	prepare *Multiplan* for a function takes the quantity ordered and compares this number to the list in column 2, yielding the discount
6	R6C4	V R[−3]C*R[−2]C*(1−R[−1]C) <RETURN>	uses the percent discount, quantity ordered, and price per disk to calculate the final price of the order

Table 9-9. A Picture of the Lookup Table.

	1	2	3	4
1				
2				
3		Quantity ordered:		1
4		Price per disk:		$3.50
5		Percent Discount:		0%
6		Final Price:		$3.50
7				
8				
9		Quantity	Discount	
10		==========	==========	
11		1	0%	
12		10	5%	
13		50	8%	
14		100	10%	
15		500	15%	
16		1000	18%	
17		5000	20%	
18		10000	22%	

Table 9-10. A Lookup Table Added to the Yearly Report Spreadsheet.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1															
2			income			transactions									
3		services				cash account		checking account					expenses		
4	month	cash	check	sales	misc	receipts	payments	deposits	payments	balance	stationary	postage	phone	rent&util	misc
5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6										$1375.40					
7	August	$80.00	$675.00	$660.75	$0.00	$80.00	$51.35	$1240.75	$1988.49	$627.66	$12.15	$9.35	$78.37	$1322.97	$587.00
8	September	$325.00	$1325.78	$1245.38	$0.00	$325.00	$328.80	$2691.16	$1404.60	$1914.22	$7.82	$3.80	$98.22	$1298.56	$0.00
9										$1914.22					
10										$1914.22					
11										$1914.22					
12	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13		$405.00	$2000.78	$1906.13	$0.00	$405.00	$380.15	$3931.91	$3393.09	$1914.22	$19.97	$13.15	$176.59	$2621.53	$587.00
14															
15															
16		Total Income		$4311.91			Months Elapsed		2		Federal Income Tax Table				
17		Total Expenses		$3418.24							---				
18		Net Income		$893.67							$0.00	0%			
19		Monthly Net Income		$446.84							$5000.00	3%			
20											$10000.00	7%			
21		Est Annual Income		$5362.02							$15000.00	15%			
22		Est Fed Tax Rate		3%							$20000.00	23%			
23		Est Annual Fed Tax		$160.86							$30000.00	35%			
24											$50000.00	48%			

Table 9-11. Coding for the Lookup Table Addition.

	Coord.	Commands/Formulas	Explanation
1		enter titles	
2		format titles	
3		set up line	
4		enter numeric data	
5	R22C4	V LOOKUP(R[−1]C,R[−4]C[+8]:R[+2]C[+9]) <RETURN>	returns a tax rate determined by the Federal Income Tax Table corresponding to the estimated annual income
6	R23C4	V R[−1]C*R[−2]C <RETURN>	multiplies the tax rate by the estimated annual income

Chapter 10

Budgeting with an Electronic Spreadsheet

The greatest advantage of an electronic work sheet is its flexibility. It enables one to perform "whatif?" scenarios with great speed and dexterity. Experimental data may be entered in a flash and stolid *Multiplan* quickly assesses the new data.

Budget applications exploit these features of *Multiplan* very well. Often when appropriations are made, there is an optimum plant that will yield the greatest returns. Budgeting may help you discover this.

One typical budget analysis compares monetary allocations for different years. The increase or decrease in funding lends insight to where spending may be pared or increased. One such budget appears in Table 10-1. To set up that budget, follow the steps in Table 10-2.

Notice how the increase or decrease in spending is compared for the various years. By comparing past figures, averaging growth rates, and estimating rate increases, you can estimate reliable figures for future budgets. This kind of estimate is especially helpful in home or business management.

A "WHAT IF?" REAL ESTATE SCENARIO

Now for some sophisticated experimentation. Investing in real estate offers many tax breaks that sometimes actually pay for the investment itself. Let's assume you bought an apartment for $20,000. (Okay, it's not the best one in town.) You have a 30 year mortgage at 12 percent interest. The monthly payments are $205.73. Rental income is $150 per month. Maintenance totals $625.00 a year. In addition you may depreciate the house at a rate of 6 percent a year over a 15 year period. These figures are *much* easier to analyze on a spreadsheet. They are layed out on a spreadsheet in Table 10-3. (The coding is in Table 10-4.)

It is important to calculate what percentage of the monthly payment is being used to pay interest and what percentage is being used to reduce the amount of principal. The part that is being used to pay the interest is tax deductible. There is an application in Appendix D to determine loan payment breakdowns for those who are interested.

The total deductible expenses and total income are calculated and entered in the appropriate

Table 10-1. A Budget Spreadsheet.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1													
2													
3	Year	¦	phone	% change	¦	utilities	% change	¦	recreation	% change	¦	savings	% change
4	------	+	----------	----------	+	----------	----------	+	----------	----------	+	----------	----------
5	1977	¦	$381.23		¦	$1275.56		¦	$2756.35		¦	$4592.00	
6	1978	¦	$398.74	4.39%	¦	$1392.76	8.41%	¦	$2725.48	-1.13%	¦	$4474.50	-2.63%
7	1979	¦	$415.23	3.97%	¦	$1385.72	-0.51%	¦	$2815.18	3.19%	¦	$4678.00	4.35%
8	1980	¦	$450.90	7.91%	¦	$1410.97	1.79%	¦	$2870.82	1.94%	¦	$4682.00	0.09%
9	1981	¦	$465.71	3.18%	¦	$1520.32	7.19%	¦	$2945.27	2.53%	¦	$4698.50	0.35%
10	1982	¦	$412.31	-12.95%	¦	$1598.73	4.90%	¦	$2725.71	-8.06%	¦	$5218.00	9.96%
11	1983	¦	$395.37	-4.28%	¦	$1504.69	-6.25%	¦	$3150.88	13.49%	¦	$5400.00	3.37%
12		¦			¦			¦			¦		
13		¦	$2919.49	0.37%	¦	$10088.75	2.59%	¦	$19989.69	1.99%	¦	$33743.00	2.58%
14	------	+	----------	----------	+	----------	----------	+	----------	----------	+	----------	----------
15	1984	¦	$396.83		¦	$1543.67		¦	$3213.68		¦	$5539.38	
16	est.	¦			¦			¦			¦		
17		¦			¦			¦			¦		

Table 10-2. Coding for the Budget Spreadsheet.

Coord.	Commands/Formulas	Explanation
1	enter titles	
2	format titles	
3	set up lines	
4	enter dollar amounts for years 1977 through 1983	
5 R6C4	1-R[-1]C[-1]/RC[-1] <RETURN>	calculates the percent increase in spending during the year
6 R6C4	F C <TAB> <TAB> % <TAB> 2 <RETURN>	format the cell R6C4 to percent format with two decimal places
7 R6C4	C D 5 <RETURN>	copy down cells
8 R13C4	V AVERAGE (R[-7]C:R[-2]C) <RETURN>	calculates the average rate of of change

Table 10-2. Coding for the Budget Spreadsheet. (Continued from page 82.)

Coord.	Commands/Formulas	Explanation
9 R6C13	F	format
	C	the cell
	<TAB>	R6C13
	<TAB>	
	%	to percent format
	<TAB>	with
	2 <RETURN>	two decimal places
10 R6C4	C	copy
	F	from
	:R13C4	cells in the range R6C4:R13C4
	<TAB>	to
	R6C7 <RETURN>	R6C7
11 R6C7	C	copy
	F	from
	:R13C7	cells in the range R6C7:R13C7
	<TAB>	to
	R6C10 <RETURN>	R6C10
12 R6C10	C	copy
	F	from
	:R13C10	cells in the range R6C10:R13C10
	<TAB>	to
	R6C13 <RETURN>	R6C13
13 R13C3	V	a formula to calculate the sum
	SUM(R[−8]C:R[−2]C)	of the corresponding column of
	<RETURN>	data
14 R13C6	V	
	SUM(R[−8]C:R[−2]C)	
	<RETURN>	
15 R13C9	V	
	SUM(R[−8]C:R[−2]C)	
	<RETURN>	
16 R13C12	V	
	SUM(R[−8]C:R[−2]C)	
	<RETURN>	
17 R15C3	V	estimates next year's budget
	R[−2]C[+1]*R[−4]C+R[−4]C	based on the average rate
	<RETURN>	of increase during the past
		seven years
18 R15C6	V	
	R[−2]C[+1]*R[−4]C+R[−4]C	
	<RETURN>	
19 R15C9	V	
	R[−2]C[+1]*R[−4]C+R[−4]C	
	<RETURN>	
20 R15C12	V	
	R[−2]C[+1]*R[−4]C+R[−4]C	
	<RETURN>	

Table 10-3. Real Estate Investment Spreadsheet.

	1	2	3	4	5	6	7
1				Month	Year	b	
2			Interest	$205.73	$2468.76	Price:	$20000.00
3			Rent	$150.00	$1800.00	Tax Rate:	38.00%
4							
5		¦					
6	Year	¦	Interest	Rent	Value	Depreciation	Maintenance
7	------	+	----------	----------	----------	----------	----------
8	1	¦	$2468.76	$1800.00	$20000.00	$1200.00	$625.00
9	2	¦	$2468.76	$1800.00	$18800.00	$1128.00	$625.00
10	3	¦	$2468.76	$1800.00	$17672.00	$1060.32	$625.00
11	4	¦	$2468.76	$1800.00	$16611.68	$996.70	$625.00
12	5	¦	$2468.76	$1800.00	$15614.98	$936.90	$625.00
13	6	¦	$2468.76	$1800.00	$14678.08	$880.68	$625.00
14	7	¦	$2468.76	$1800.00	$13797.40	$827.84	$625.00
15	8	¦	$2468.76	$1800.00	$12969.55	$778.17	$625.00
16	9	¦	$2468.76	$1800.00	$12191.38	$731.48	$625.00
17	10	¦	$2468.76	$1800.00	$11459.90	$687.59	$625.00
18	11	¦	$2468.76	$1800.00	$10772.30	$646.34	$625.00
19	12	¦	$2468.76	$1800.00	$10125.96	$607.56	$625.00
20	13	¦	$2468.76	$1800.00	$9518.41	$571.10	$625.00
21	14	¦	$2468.76	$1800.00	$8947.30	$536.84	$625.00
22	15	¦	$2468.76	$1800.00	$8410.46	$504.63	$625.00
23	16	¦	$2468.76	$1800.00	.		$625.00
24	17	¦	$2468.76	$1800.00			$625.00
25	18	¦	$2468.76	$1800.00			$625.00
26	19	¦	$2468.76	$1800.00			$625.00
27	20	¦	$2468.76	$1800.00			$625.00
28	21	¦	$2468.76	$1800.00			$625.00
29	22	¦	$2468.76	$1800.00			$625.00
30	23	¦	$2468.76	$1800.00			$625.00
31	24	¦	$2468.76	$1800.00			$625.00
32	25	¦	$2468.76	$1800.00			$625.00
33	26	¦	$2468.76	$1800.00			$625.00
34	27	¦	$2468.76	$1800.00			$625.00
35	28	¦	$2468.76	$1800.00			$625.00
36	29	¦	$2468.76	$1800.00			$625.00
37	30	¦	$2468.76	$1800.00			$625.00
38	------	+	----------	----------	----------	----------	----------
39	total	¦	$74062.80	$54000.00		$12094.16	$18750.00
40		¦					
41							
42			Total				
43			Costs	Income	Deductions	Net Gain	
44			$92812.80	$61905.84	$84906.96	$1357.68	

Table 10-4. Coding for the Real Estate Investment Spreadsheet.

Coord.	Commands/Formulas	Explanation
1	enter titles	
2	format titles	
3	set up lines	
4	enter figures in columns 3, 4, and 7. the interest and rent should refer to R2C3 and R3C3 respectively	
5 R8C5	V R[−6]C[+2] <RETURN>	gets the cost of the apartment from the cell labeled price. this technique makes exploring what if scenarios much easier since only one cell needs to be changed on the entire spreadsheet when changing the price.
6 R8C6	0.06*RC[−1] <RETURN>	calculates the depreciation on the remaining value of the house
7 R8C6	C D 14 <RETURN>	copy the cell's contents downwards 14 cells
8 R9C5	V R[−1]C−R[−1]C[+1] <RETURN>	determines the new value of the house by subtracting the previous years depreciation from the value of the house
9 R9C5	C D 13 <RETURN>	copy the cell contents downwards 13 cells
10 R8C7	625 <RETURN>	enter the number 625 in sheet
11 R9C7	V R[−1]C <RETURN>	
12 R9C7	C D 28 <RETURN>	copy the cell's contents downwards 29 cells
13 R39C3	V SUM(R[−2]C:R[−31[C) <RETURN>	sum the column
14 R39C3	C R 4 <RETURN>	copy to the right four cells
15 R39C5	B <RETURN>	erase (blank) the cell

Table 10-4. Coding for the Real Estate Investment Spreadsheet (continued from page 85).

Coord.	Commands/Formulas	Explanation
16 R44C3	V R[−5]C+R[−5]C[+4] <RETURN>	costs equal interest plus maintenance
17 R44C4	V R[−5]C+R[−42]C[+3]−R[−5]C[+2] <RETURN>	income equals rent plus the price of the house minus its depreciation
18 R44C5	V R[−5]C[−2]−R[−42]C[+2]+R[−5]C[+1]+R[−5]C[+2] <RETURN>	deductions equals the interest minus the cost of the house plus the depreciation plus the maintenance
19 R44C6	V RC[−2]+RC[−1]*R[−41]C[+1]−RC[−3] <RETURN>	net gain equals income minus costs plus deductions discounted by the tax rate

cells. At a glance, we can see the effect of this investment. And if the interest rate, rent, or other such factors were to change, the new scenario could be explored very easily.

Multiplans inherent speed and flexibility allows you to use the same spreadsheet to evaluate other investment opportunities. Compare the results of the previous investment opportunity with the following. The mortgage is a 20 year mortgage available at 13 percent interest for a $30,000 principal. Monthly payments are pegged at $351.48. Your monthly rental income is $275.00 and maintenance runs $780 a year. Well, which investment holds more promise? Ask *Multiplan*.

EXAMINING PAST EXPENDITURES

Budget analysis has other applications. Large corporations normally have advertising budgets the

Table 10-5. Advertising Budget Spreadsheet.

	1	2	3	4	5	6
1						
2						
3	Advertising Expenditures					
4						
5	Year	Sales	Expenses	Advertising	% Expenses	Net Profits
6	----------	----------	----------	----------	----------	----------
7	1978	$35700.00	$31100.00	$2830.00	9.10%	$4600.00
8	1979	$41300.00	$35800.00	$4910.00	13.72%	$5500.00
9	1980	$52600.00	$44300.00	$4530.00	10.23%	$8300.00
10	1981	$48900.00	$42500.00	$4020.00	9.46%	$6400.00
11	1982	$45200.00	$41000.00	$4140.00	10.10%	$4200.00
12	1983	$49300.00	$43400.00	$4660.00	10.74%	$5900.00
13						
14	Yr Avg	$45500.00	$39683.33	$4181.67	10.56%	$5816.67

Table 10-6. Coding for Advertising Budget Spreadsheet.

Coord.	Commands/Formulas	Explanation
1	enter titles	
2	format titles	
3	set up line	
4	enter dollar amounts for years 1978 through 1983	
5 R7C5	V RC[−1]/RC[−2] <RETURN>	calculates the advertisings fraction of total expenses
6 R7C5	C D 5 <RETURN>	copy downwards five cells
7 R7C6	V RC[−4]−RC[−3] <RETURN>	net profits equals sales minus expenses
8 R7C6	C D 5 <RETURN>	copy downwards five cells
9 R14C2	V AVERAGE(R[−2]C:R[−7]C) <RETURN>	take the average of the column
10 R14C2	C R 4 <RETURN>	copy to the right four cells

size of a Central American nation's treasury. Therefore, finding the optimum advertising budget is essential to a company's operating success.

In a new work sheet (see Table 10-5) enter advertising expenses, gross revenues, net profits, and total operating expenses. A seven-year time period is followed. Using past performance, your mission is to decide how much of the company's budget should be devoted to advertising. (Although it is someone else's task to allocate the budget to radio, TV, or newspaper advertising you could set up another spreadsheet...) Follow the instructions in Table 10-6 to set up the spreadsheet.

For those who are *Multiplan* professionals, determining an optimum advertising budget should be easy. Now that the figures have all been placed in one table and the numbers compared, it is far easier to analyze the past performances. Once the numbers have been crunched, advertising allocations may be determined.

Chapter 11

Advanced Functions for Statisticians, Mathematicians, and the Curious

Multiplan contains built-in functions that are very useful for statistical and mathematical analysis. These functions reduce complicated formulas to simple operations, so you do not need a degree from The London School of Economics to use them.

NET PRESENT VALUE

Two internal functions useful in statistics and economics are *Net Present Value* and *Standard Deviation*. Net Present Value is enlisted to examine investments. Inflation and Technological advancements constantly change the value of our money. One-hundred dollars in 1950 bought more goods than the same sum in 1980. Therefore, one-hundred 1950 dollars is more valuable than one-hundred 1980 dollars. By the same methodology $1000 today is worth more than $1000 will be worth ten years from now. If a mattress were filled with $1000 today, and the money was allowed to ferment for ten years, because of inflation it might be worth only $300 in today's terms, because the money's value depreciates.

The effects of inflation and technology must be taken into consideration when evaluating investments. For example, let's say you were on the verge of leasing a ski lodge for seven years at $100,000. Your research indicates that there will be a $15,000 return at the end of the first year and that the returns should increase by 25 percent a year. Before you commit $100,000 you must know whether or not it is a wise investment. You might want to find the Net Present Value of the estimated income for the next seven years and then base your decision on this number. (There are other ways to evaluate investments, but the Net Present Value is a very important method.)

Your spreadsheet will look like the one in Table 11-1.

The Net Present Value command is:

NPV(Rate, List)

The rate represents the rate of interest minus the rate of inflation. List represents the monetary

Table 11-1. Spreadsheet Calculating the Net Present Value of an Investment Opportunity.

	1	2	3	4	5	6	7
1							
2							
3							
4	Lease	$100000.00					
5	Interest	15.75%					
6	Inflation	3.40%					
7	Net Rate	12.35%					
8							
9			Estimated Returns				
10							
11	1983	1984	1985	1986	1987	1988	1989
12	$15000.00	$18750.00	$23437.50	$29296.88	$36621.09	$45776.37	$57220.46
13							
14	Net Present Value		$131664.40				

Table 11-2. Coding for the Net Present Value Spreadsheet.

Coord.	Commands/Formulas	Explanation
1	enter titles	
2	format titles	
3	enter initial amounts for the lease, interest, inflation, year (R11C1) ,and returns (R12C1)	
4 R7C2	V R[−2]C−R[−1]C <RETURN>	net rate equals interest minus the inflation rate
5 R11C2	1+RC[−1] <RETURN>	when one has a large number of dates, this is the easiest way to set up the titles
6 R12C2	1.25*RC[−1] <RETURN>	returns increase by 25% a year
7 R11C2	C R 5 <TAB> :R12C2	copy the formula to the right five cells from cells in the range R11C2:R12C2
8 R14C3	V NPV(R[−7]C[−1],R[−2]C [−2]:R[−2]C[+4]) <RETURN>	uses the net rate and the estimated returns for each year to calculate the NPV of the total returns

return on your investment. In this case the monetary return is in R14C3. The interest rate minus the rate of inflation is in R7C2. With this in mind, append the coding in Table 11-2 to the spreadsheet.

The return on your own investment is over $130,000. The investment is ahead of the net rate, therefore you might consider leasing the ski lodge. To check the merits of the investment, you would compare these figures with the NPV's of other investments.

STANDARD DEVIATION

Standard deviation is very useful in statistical studies. The standard deviation indicates how

Table 11-3. Table Incorporating Standard Deviation.

Coord.	Commands/Formulas	Explanation
1	enter titles	
2	format titles	
3	enter numbers for test data and test range	
4	set up lines	
5 R5C6	10000 <RETURN>	an arbitrary high number chosen so any rod that is longer than 3.015 meters will be in group 4
6 R18C1	V STDEV (R[−4]C:R[−11]C) <RETURN>	calculates the standard deviation of the column of test data
7 R20C1	V AVERAGE (R[−6]C:R[−13]C) <RETURN>	calculates the average length
8 R7C3	V IF (AND(RC[−2]<R5C3,RC[−2]>=R4C3),1,0) <RETURN>	checks to see which test range the test data belongs
9 R7C4	V IF (AND (RC[−3]<R5C4,RC[−3]>=R4C4),1,0) <RETURN>	
10 R7C5	V IF (AND(RC[−4]<R5C5,RC[−4]>=R4C5),1,0) <RETURN>	
11 R7C6	V IF (AND(RC[−5]<R5C6,RC[−5]>=R4C6),1,0) <RETURN>	
12 R7C3	C D <TAB> :C6 <RETURN>	copy the formulas downwards from R7C3:R7C6

Table 11-4. Coding for the Standard Deviation Spreadsheet.

	1	2	3	4	5	6
1						
2	Production Analysis					
3				Test Range		
4			0.000	2.985	3.000	3.015
5	Test Data	¦	2.985	3.000	3.015	10000.000
6	----------	+	----------	----------	----------	----------
7	3.018	¦	0	0	0	1
8	2.984	¦	1	0	0	0
9	2.983	¦	1	0	0	0
10	3.011	¦	0	0	1	0
11	2.993	¦	0	1	0	0
12	2.998	¦	0	1	0	0
13	3.017	¦	0	0	0	1
14	3.005	¦	0	0	1	0
15		¦				
16						
17	Standard Deviant					
18	0.01387122					
19	Mean					
20	3.001125					

widely distributed the data is. The following example illustrates one case where standard deviation might be useful

The Aerospace Company (a generic company) produces aluminum rods to provide structural support for modern jetliners. These rods must have very precise measurements to pass the company's quality tests. The rods are supposed to measure 3 meters in length. Rods that are either 1.5 cm too short or 1.5 cm too long are rejected and sent back to the smelter. This means that the deviation should be limited to 1.5 cm. The Aerospace Company has been experiencing difficulties lately. The *average* length of all rods produced has been well within the quality control boundaries, yet a disproportionate number of the rods have become rejects.

The data for some random rod measurements (in meters) follows:

3.005 3.017 2.998 2.993
3.018 2.983 2.984 3.011

The average of the numbers is 3.0011, a length well within the limits. However, 50 percent of the sample consists of rejects. One way to judge the extent of this variance employs a formula for Standard Deviation. This formula is ornery and resembles something you might see in a post graduate math text from Cal Tech. *Multiplan*, the mathematician, has this easy-to-use formula:

STDEV(List)

To find the formula simply indicate the range of cells that contains the sample. For practice, follow the coding in Table 11-3 on a fresh *Multiplan* work sheet to produce the classy-looking spreadsheet in Table 11-4.

Multiplan returns .0138712 indicating a range that two-thirds of the data should lie within. This range is centered around the average of all the data (3.001125). The range is the average plus or minus the standard deviation. Therefore, two-thirds of all

the measurements should lie within the range of 2.9872538 to 3.0149962.

In addition, 95 percent of the data should lie within two deviants of the average. Thus 95% of the data should lie between the figures 2.9733826 to 3.0288674. Due to the small size of the sample there are a few minor discrepancies, but otherwise the information is accurate.

Since two-thirds of the measurements should fall within the acceptable range (one standard deviant), approximately one-third of the rods are rejects. From our sample of eight rods, this does not fit our figure of 50 percent rejects. This may be attributed to the limited size of our sample. Just as you would not predict the winner of the presidential elections by polling eight people, you would not base the production study on eight rods.

As further practice for those considering entering Wharton, there are some work sheets incorporating Standard Deviation and Net Present Value in Appendix D.

MATHEMATICAL FUNCTIONS

Multiplan has a series of functions that are very useful in mathematical applications. These functions consist of trigonometric functions and logarithmic functions. The math functions are useful in a number of applications, including statistics, physics, navigation, and the sciences. The goal of the chapter is not to teach trigonometry. But for those who already understand trig, it would be worthwhile to explore the additional options *Multiplan* offers.

SIN(n)	**LN(n)**	**ROUND(n)**
COS(n)	**LOGIO(n)**	**MOD(n)**
TAN(n)	**EXP(n)**	**INT(n)**
ATAN(n)	**PI( )**	**ABS(n)**
	SQRT(n)	**SIGN(n)**

In each case, "n" indicates a number to perform the function on. Trigonometric functions are calculated in Radians. Each formula is explained briefly in Appendix B.

Chapter 12
Conclusion

The *Multiplan* book was designed as a tutorial and applications book. The most important commands and functions were discussed in detail in the early chapters of the book. Commands that are arcane and unpopular were left for Appendix B, where they are explained briefly. Such commands are very similar to other commands in the book and by now should be very easy to comprehend and employ.

As a quick reference for when you forget that crucial command, Appendix A offers a tree diagram. The diagram lists all the commands and functions of *Multiplan* and how to access them. You might consider keeping this by your computer at all times.

Appendix D offers a variety of work sheets for those interested in practicing their skills or gaining additional insights in using *Multiplan*. These work sheets are on different skill levels. They also may be used to review skills learned from the book.

Appendix C gives some pointers on disk care. Finally, the Glossary consists of a collection of various terms used during the book, and some elements of computer jargon that you may be subjected to at the office.

We strongly encourage you to apply your newly acquired skills.

Appendix A

Listing of All *Multiplan* Commands, Functions, and Special Keys

Table A-1. *Multiplan* Commands, Functions, and Options.

Cell Cursor Movement
Up
Down
Left
Right
Next Window
Next Unlocked Cell

Scroll The Window
Page Up
Page Down
Page Left
Page Right
Home
End

Selection/Execution
Cancel Present Comm.
Do Highlighted Comm.
Select Next Comm.
Select Previous Comm.
Tab
Give Help
Recalculate

Editing Cells
Delete
Move one left
Move one right
Move one word left
Move one word right
Change Relative Ref's
to Absolute Ref's

Commands
ALPHA

BLANK
cells

COPY
Right
Down
From

DELETE
Row
Column

EDIT

FORMAT
Cells:
Alignment
DEF
CTR
Gen
Left
Right
–
Format Code
Def
Cont
Exp
Fix
Gen
Int

Commands
$
*
%
–
Default:
Format
* Width
Options:
Comma
Formula
Width:

GOTO
Name
Row-Col
Window

HELP
Resume
Start
Next
Previous
Applications
Commands
Editing
Formulas
Keyboard

INSERT
Row
Column

Commands
LOCK
Cells
Formulas

MOVE

NAME

OPTIONS
Recalc
Mute
Iteration + Comp.

PRINT
Printer
File
Margins
Options

QUIT

SORT

TRANSFER
Load
Save
Clear
Delete
Options
Rename

VALUE

WINDOW
Split
Horizontal
Vertical
Titles
Border
Close
Link

XTERNAL
Copy
List
Use

Functions/Formulas
Groups:
Average( )
Column( )
Count( )
Index(,,)
Lookup(,)
Max( )
Min( )
NPV( )
Row( )
STDEV( )

Mathmatical Functions:
ABS( )
ATAN( )
COS( )
EXP( )
LN( )
LOGIO( )
MOD(,)
PI( )
ROUND(,)
SIGN( )
SIN( )
SQRT ( )
TAN( )

Logical Functions:
AND(,)
FALSE( )
IF(,,)
ISERROR( )
ISNA( )
NA( )
NOT( )
OR( )
TRUE( )

Text and Format Func:
Dollar( )
(FIXED(,)
INT( )
LEN( )
MID(,,)
REPT(,)
VALUE( )

Appendix B

Summary of All *Multiplan* Commands

This is a summary of the commands, functions, and formulas available in *Multiplan*. Many computers have a number of function keys that may be used instead of the following two-key combinations. These special keys are listed for different computers in the *Multiplan* Quick Reference Guide.

CTRL represents the control key. The CTRL key must be held down, like the shift key on a typewriter, and the desired character typed.

CELL CURSOR MOVEMENT (Chapter 4)

The up, down, left, and right arrow keys may be used to move the cell cursor. Computers that lack these keys should use the following combination of keys:

UP	CTRL-E
DOWN	CTRL-X
LEFT	CTRL-S
RIGHT	CTRL-D
NEXT WINDOW	; or CTRL-W
NEXT UNLOCKED CELL	CTRL-F or LINEFEED

The E, X, S, and D keys are arranged in a diamond. The keys are arranged in a logical fashion. The E key, which is on top, moves the cell cursor upwards. The S key, which is on the left, moves the cell to the left. The other keys are arranged in a similar manner.

SCROLL THE WINDOW

To move the cell cursor rapidly across the work sheet use the following keys. Some computers have

special keys for HOME, END, PAGE UP, and PAGE DOWN. Those computers do not require these functions.

PAGE UP	CTRL-R CTRL-E
PAGE DOWN	CTRL-R CTRL-X
PAGE LEFT	CTRL-R CTRL-S
PAGE RIGHT	CTRL-R CTRL-D
HOME (moves cursor to upper left corner of work sheet)	CTRL-Q
END (moves cursor to lower left corner of work sheet)	CTRL-Z

As before, the keys are in a convenient pattern.

SELECTION AND EXECUTION COMMANDS (Chapter 4)

Cancel Present Command	ESC or CTRL-C
Do Highlighted Command	RETURN
Select Next Command on Menu	SPACE BAR
Select Previous Command on Menu	BACKSPACE or CTRL-H
Tab to Next Command Setting	TAB or CTRL-I
Give Help for Highlighted Command	? .
Recalculate Work sheet	!

EDITING CELLS AND COMMANDS (Chapters 4 and 7)

Cells may be edited before the data is entered. After the data is entered, the cell may be edited by entering the edit mode (typing "E" from the main menu) and then using the keys below.

Delete Character	DELETE, BACKSPACE, CTRL-Y, or CTRL-H
Move Cursor One Character Left	CTRL-K
Move Cursor One Character Right	CTRL-L
Move Cursor One Word Left	CTRL-O
Move Cursor One Word Right	CTRL-P
Change Relative References to Absolute References	@

COMMANDS AND SUBCOMMANDS

Commands and subcommands are selected by typing the first letter of the command or subcommand.

ALPHA: Permits entry of text on work sheet (Chapter 4).

BLANK cells: Erases contents of indicated cells (Chapters 4 and 5).

COPY (Chapter 5):

- **Right:** Copies marked cells toward the right the designated number of times.
- **Down:** Copies marked cells downwards the designated number of times.
- **From:** Copies marked cells to other cells.

DELETE (Chapter 6):

- **Row:** Deletes rows between specified columns.
- **Column:** Deletes columns between specified rows.
- **EDIT:** Allows editing of highlighted cell's contents (Chapter 7).

FORMAT (Chapters 6 and 8):

Changing the format only affects the cell display, not the actual cell contents.

- **Cells:** Sets the display attributes of selected cells.

Alignment:

- **Def** (Default) alignment of cell determined by alignment setting for entire work sheet.
- **Ctr** (Center) Cells' contents are centered in display area.
- **Gen** (General) numbers are right justified, text is left justified.
- **Left** Cells' contents are left-justified.
- **Right** Cells' contents are right-justified.
- **–** - Alignment is not changed.

Format Code:

Def	(Default) Format of cell determined by code setting for entire work sheet.
Cont	(Continuous) Permits lines of text to be displayed across column boundaries.
Exp	(Exponential) Figures are displayed in scientific notation.
Fix	(Fixed) Sets the number of decimal places displayed.
Gen	(General) Values are displayed as accurately as possible within column boundaries.
Int	(Integer) Numbers are rounded to the nearest integer.
$	(Dollar) Values are rounded to two decimal places and are preceded by a dollar sign.
*	(Graph) Numbers are replaced by asterisks in the cell display. Used in bar graphs.
%	(Percent) Figures are converted to percent, rounded to a fixed number of decimal places and followed by a percent sign.
–	-Format code is not changed.

Default:

Format:	Used to alter the default format of cells for the entire work sheet. The alignment and format code settings are the same as above.
Width:	Changes the default column width for entire spreadsheet.

Options:

Comma:	Places or removes commas from figures under the following formats "Fix," "Int," "$," and "%."
Formula:	Formulas are displayed instead of formula results.

Width: Modifies the column width of selected columns.

GOTO (Chapter 4):

Name: Sends cell cursor to selected named area.

Row-col: Walks cell cursor to specified coordinates.

Window: Moves cell cursor to indicated window.

HELP (Chapter 5):

Resume: *Multiplan* leaves help mode and returns to work sheet.

Start: Sends *Multiplan* to first page of help file.

Next: *Multiplan* flips to following (next) page of help file.

Previous: *Multiplan* turns to previous page of help file.

Applications: Gives a list of problems and commands that address them.

Commands: Instructs in the use of commands

Editing: Teaches how to edit cell contents.

Formulas: Provides list of all *Multiplan* formulas and functions.

Keyboard: Lists the function keys and other special keys for your specific computer.

INSERT (Chapter 6):

Row: Inserts a row between marked columns.

Column: Inserts a column between selected rows.

LOCK (Chapter 8):

Cells: Protects (locks) chosen cells from accidental changes.

Formulas: Protects (locks) all text and formulas from accidental alterations.

MOVE (Chapter 7):

Row: Moves entire rows from one row to another.

Column: Moves entire columns from one column to another.

NAME Chapter 7: Assigns a name to a range of cells.

OPTIONS (Chapter 7):

Recalc: Tells *Multiplan* to automatically recalculate the work sheet or to wait until instructed to do so.

Mute: Switches error warning alarm on and off. Initially the alarm is not muted, therefore it sounds when an error is made.

Iteration + Completion Test at: Permits approximation of complex mathematical problems, including internal rate of return, simultaneous equations, and roots of equations.

PRINT (Chapter 6):

Printer: Sends marked section of spreadsheet to printer for printout. Print options must be set first.

File: Sends designated section of spreadsheet to disk drive for storage. File may be printed at a later date.

Margins: Allows setting of printer margins.

Options: Specifies work sheet area to be printed and the format of the printout. Permits the passing of special codes to change printer settings.

QUIT(Chapter 5): Enables one to gracefully leave the *Multiplan* program.

SORT(Chapter 8): Sorts numbers, text, and symbols in a designated column.

TRANSFER (Chapters 5 and 8):

Load: Gets (loads) a work sheet from the disk drive and displays it on the screen.

Save: Saves the current work sheet on a disk.

Clear: Erases the entire spreadsheet.

Delete: Deletes a file from the disk.

Options: Defines the file format for future transferring of files by load and save.

Rename: Gives a new name to the file in use. Linked spreadsheets are linked to the new file.

VALUE (Chapter 4): Permits entry of values, formulas and functions.

WINDOW (Chapter 8):

Split:

Horizontal: Splits the work sheet into two separate windows horizontally.

Vertical: Divides the work sheet into two separate windows vertically.

Titles: Allocates rows or columns on the work sheet for titles.

Border Employed to set up or eliminate the space consuming borders around a window.

Close: Gives two windows together.

Link: Links or unlinks windows so they move synchronously or asynchronously.

XTERNAL (eXternal) (Chapter 8):

Copy: Builds connections between different work sheets. These connections facilitate exchange of data between work sheets.

List: Gives a report on how any work sheets tied to the current work sheet by XTERNAL commands is related to the current work sheet.

Use: Redefines eXternal links between work sheets by replacing an old work sheet with a new one. The work sheets must have an identical layout.

FUNCTIONS AND FORMULAS

There are a number of built-in functions in *Multiplan*. These functions have similar formats. If the proper format is understood, using a new formula is relatively easy.

Functions and Formulas for Groups of Cells

AVERAGE (range)	The average of all the numbers in range.
COLUMN( )	Gives the present column number.
COUNT (range)	The number cells within range that have numeric entries.
INDEX	(range, subscript1, subscript2) Returns a value from range according to subscript1 and subscript2.
LOOKUP (num, table)	Returns a value from table according to num.
MAX (range)	The maximum value within range.
MIN (range)	The minimum value within range.
NPV (range)	Gives the net present value of the numbers in range.
ROW ( )	Gives the present row number.
STDEV (range)	Gives the standard deviation of the values in range.
SUM (range)	The sum of all the numbers in range.

Mathematical Functions

ABS (num)	The absolute value of num.
ATAN (num)	The arctan of num in radians.
COS (num)	The cosine of num in radians.
EXP (num)	e (~2.71828) raised to the power num.
LN (num)	The logarithm of num in log base e.
LOG10 (num)	The logarithm of num in log base 10.

MOD (num1, num2)	The remainder of num1 divided by num2.
PI( )	The numerical approximation of pi.
ROUND (num1,num2)	Rounds num1 to num2 decimal places.
SIGN (num)	The sign of num.
SIN (num)	The sine of num in radians.
SQRT (num)	The square root of num.
TAN (num)	The tangent of num in radians.

Logical Functions

AND (quest1,quest2)	Returns True if all questions are True.
FALSE ( )	Returns False.
IF (quest, answer1, answer2)	Returns answer1 if question has logical value True, otherwise returns answer2.
ISERROR (X)	Returns True if X is an error value.
ISNA (X)	Returns True if X is an #N/A value.
NA( )	Returns #N/A.
NOT (quest)	Returns False if question is True, returns. True if question is False.
OR (quest1, quest2)	Returns True at least one question is True.
TRUE( )	Returns True.

Text and Format Functions

DOLLAR (num)	Converts num to a text counterpart in dollar sign format.
FIXED (num1,num2)	Converts num1 to a text counterpart having num2 decimal places.
INT (num)	Returns the integer segment of num.
LEN (text)	Returns the number of characters in text.

MID (text, num1,num2)	Returns a section of text. This section begins at the numith character and continues for num2 characters.
REPT (text, num)	Displays text repeated num times.
VALUE (text)	Converts text to its numeric counterpart.

Appendix C

Maintenance Tips

Treating your system with respect will increase its life expectancy many years. The disks will survive longer than before, the computer will be healthier than now, and you may just develop bonds with your workmate. Some of the following suggestions may seem hackneyed, but unfortunately as important as they are many are still ignored. Observing these habits will make you and your computer feel safer and happier than many other couples.

MAINTAINING DISKS

1. Always return the disk to its envelope after you have used the disk. This will prevent dust and other foreign objects from landing on the disk surface. It will also prevent accidental physical damage that could jeapordize data stored on the disk.
2. When disks are not in use, store them in a safe place that is at room temperature. Store the disks in an upright position.
3. Do not turn the power to your computer on and off with a disk in the disk drive. Occasionally disregarding this precaution has little noticeable effect. However, when you turn the system on or off, there is a surge of electricity that seethes through the machine. This may affect data stored on your disks.
4. Make frequent backup copies of your disks. If you are working throughout the day, save your work every half-hour. These steps will prevent you from ever losing more than a half-hour of work. If you do not have the disks to make backup copies on, buy some extra disks. Losing more than a half-hour's work because of power irregularities or absent mindedness is a very frustrating experience.
5. Always label your disks neatly and clearly. Just as you should not store sleeping pills in an aspirin bottle, you should not work with a stack of unlabeled disks.

MAINTAINING YOUR SYSTEM

1. Do not allow your disk drives to spin for long periods. If a disk drive spins for a great time,

and nothing happens, the disk is either blank or the computer is not ready to read the disk. Open the disk drive door, turn off the computer, and try a different approach.

2. Keep the system and your disks out of direct sunlight. Think of your system as a nomad in the desert. Exposure to the sun will age your system very rapidly. It will contribute to overheating and damage your sensitive disks.
3. Avoid all climatic extremes. Excessive heat, cold, or moisture is not ideal for the system.
4. Allow air to circulate around your computer. Personal computers are not supposed to overheat and enjoy cool weather.
5. Do not expose your computer to dust. City dwellers should not leave their computers near open windows. People try to prevent dust from getting into their IBM selectric typewriters; you should make at least as much effort to prevent dust from getting into your system.
6. Avoid turning the computer on and then off rapidly. Ideally, you should never have to stop an operation by turning the computer on and off. However, if you must turn off the computer, wait 10 seconds before turning it back on. This will allow the information in the computer's memory to be completely erased.
7. If you must smoke, do not smoke around your computer. Smoking contributes to airborne dust. Computer circuits are constructed in dust-free environments. If you keep dust and soot away from your computer, you will have a family heirloom that may be passed down to your grandchildren.
8. Do not maliciously attack the keyboard. Keyboards wear down with use. Some keys actually break on poorly designed models. Targeting your aggressions at the computer will only result in future headaches.
9. The disk drives are very sensitive. Be extremely careful with them. Make sure they are not jolted. In addition open the disk drive doors slowly. The doors should not spring open. Leave the disk drive door open when you do not have a disk in the drive.
10. Lastly, be very careful when handling liquids near your computer. Pamper your computer and put up with its idiosynchracies, and your computer will live a long, fruitful life.

Ironically there are many stories about computers that have had bookcases fall on them, houses burn down around them, or angry owners throw them out windows. These stories seem so incredible because the computers survived with only a few minor scratches. However, there have been many more semi-tragic accidents where several day's work has been lost, or disks destroyed by simple carelessness. Treating your unit with respect will ensure your unit's integrity.

Appendix D

Additional Spreadsheet Applications

INVOICE

A simple program may be designed to create invoices for small businesses. The coding is relatively simple, and the results quite satisfying.

Table D-1. Coding to Produce an Invoice.

	Coordinates	Commands/Formulas	Explanation
1		enter titles	
2		set up lines	
3		format titles	
4		change column widths	
5	R16C11	V RC[−2]*RC[−4] <RETURN>	amount equals price times quantity
6	R16C11	C D 6 <RETURN>	copy downwards six cells
7	R24C11	V SUM(R[−8]C:R[−2]C) <RETURN>	the subtotal equals the sum of all amounts
8	R25C11	.0825*R[−1]C <RETURN>	the sales tax
9	R26C11	V R[−1]C+R[−2]C	total equals the sales tax plus the subtotal

Table D-2. The Invoice that Results from the Coding in Table D-1 .

```
      1    2     3        4        5    6 7 8     9    10    11
 1
 2
 3              The Conglomerate, Inc
 4              1 World Trade Center
 5              New York, NY  10001
 6
 7                 INVOICE
 8
 9 ================================================================================
10 Name:     Fred Flintstone        Date:     9/18/83
11 Address:  35 Marble Road         Sold By:  31
12 City/St:  Rockland, Md           Zip Code: 20081
13
14 ----------+------------------------------+-----+-----------+----------
15 Stock No. ¦          Description         ¦ Qty ¦   Price   ¦   Amount
16 34-150    ¦ Olivetti Film Cartridges     ¦ 12  ¦    $3.65  ¦   $43.80
17 12-329    ¦ Ream of 20lb 8.5 x 11 paper  ¦ 15  ¦    $5.75  ¦   $86.25
18           ¦                              ¦     ¦           ¦    $0.00
19           ¦                              ¦     ¦           ¦    $0.00
20           ¦                              ¦     ¦           ¦    $0.00
21           ¦                              ¦     ¦           ¦    $0.00
22           ¦                              ¦     ¦           ¦    $0.00
23 ----------+------------------------------+-----+-----------+----------
24                                                 Sub Total      $130.05
25                                                 Sales Tax       $10.73
26                                                 Total Amt      $140.78
```

INTEREST

The following spreadsheet may be used to separate loan payments into payments towards principal and payments towards interest. This is important since the government allows us to deduct money from our taxes that pay interest (but not principal). In addition, the breakdown changes each year, thus a spreadsheet proves very useful.

When building this spreadsheet, one should build the table for 1984 first. Upon completion, this table may then be copied any number of times to yield the desired number of years of analysis. This code will set up the system and copy it onto 1985's spreadsheet.

Table D-3. Coding for a Interest vs. Principle Spreadsheet .

	Coord.	Commands/Formulas	Explanation
1		enter titles	
2		set up lines	
3		format titles	
4		change column widths	
5	R14C8	30000 <RETURN>	the initial principal
6	R15C3	1 <RETURN>	the initial month
7	R15C5	(R5C2/12)*R[-1]C[+3] <RETURN>	the portion of the payment allocated to interest
8	R15C6	V R4C2-RC[-1] <RETURN>	the portion allocated to principal payment equals the monthly payment minus the interest payment.
9	R15C8	V R[-1]C-RC[-2] <RETURN>	amount of principal remaining
10	R15C5	C D 11 <TAB> :CB <RETURN>	copy downwards eleven cells from cells in the range R15C5:R15C8
11	R16C3	1+R[-1]C <RETURN>	increment the month
12	R16C3	C D 10 <RETURN>	copy downwards ten cells
13	R27C5	V SUM (R[-12]C:R[-1]C) <RETURN>	sum the column of cells
14	R27C5	C R 1 <RETURN>	copy to the right one cell
15	R9C2	C F :R27C9 <TAB> R29C2 <RETURN>	copy from cells in the range R9C2:R27C9 to R29C2
16	R35C3	1+R[-9]C <RETURN>	change the last month referenced
17	R34C8	V R[-8]C <RETURN>	change the last month referenced

You may continue copying this group of cells across the spreadsheet. Some loans run for twenty to thirty years, thus a great deal of copying may be required.

Table D-4. Spreadsheet of Interest/Principle Breakdowns for Each Loan Payment.

	1	2	3	4	5	6	7	8	9
1					Loan Payments Breakdown				
2									
3	Principal:	$30000.00				Total Payments			
4	Payments:	$512.00				Total Principal Payment		$2536.03	
5	Interest:	12.5%				Total Interest Payment		$3607.97	
6									
7									
8									
9			Year		1984				
10									
11					Interest	Principal	¦	Principal	
12			Month		Payment	Payment	¦	Remaining	
13		----------					+-		
14							¦	$30000.00	
15			1		$312.50	$199.50	¦	$29800.50	
16			2		$310.42	$201.58	¦	$29598.92	
17			3		$308.32	$203.68	¦	$29395.24	
18			4		$306.20	$205.80	¦	$29189.44	
19			5		$304.06	$207.94	¦	$28981.50	
20			6		$301.89	$210.11	¦	$28771.39	
21			7		$299.70	$212.30	¦	$28559.09	
22			8		$297.49	$214.51	¦	$28344.58	
23			9		$295.26	$216.74	¦	$28127.84	
24			10		$293.00	$219.00	¦	$27908.84	
25			11		$290.72	$221.28	¦	$27687.56	
26			12		$288.41	$223.59	¦	$27463.97	
27		Year's Total			$3607.97	$2536.03			
28									
29			Year		1985				
30									
31					Interest	Principal	¦	Principal	
32			Month		Payment	Payment	¦	Remaining	
33		----------					+-		
34							¦	$27463.97	
35			13		$286.08	$225.92	¦	$27238.05	
36			14		$283.73	$228.27	¦	$27009.78	
37			15		$281.35	$230.65	¦	$26779.13	
38			16		$278.95	$233.05	¦	$26546.08	
39			17		$276.52	$235.48	¦	$26310.60	
40			18		$274.07	$237.93	¦	$26072.67	
41			19		$271.59	$240.41	¦	$25832.26	
42			20		$269.09	$242.91	¦	$25589.35	
43			21		$266.56	$245.44	¦	$25343.90	
44			22		$264.00	$248.00	¦	$25095.90	
45			23		$261.42	$250.58	¦	$24845.32	
46			24		$258.81	$253.19	¦	$24592.12	
47		Year's Total			$3272.16	$2871.84			

Glossary

absolute referencing—A method of referring to cells by their location. An *absolute reference* will always refer to the same location regardless of changes made on the work sheet. The opposite is *relative referencing.*

alignment—A format option enabling one to center, left-justify, or right-justify entries in cells. Normally, text is left-justified and numbers are right-justified.

Boolean algebra—A deductive logic system in which there are only two possible answers, true or false.

cell—A location where text, formulas, or data may be placed. The *Multiplan* work sheet is a collection of individual *cells.*

cell cursor—The lighted bar indicating your present location on the *Multiplan* work sheet.

cell width—The number of spaces allocated to the cell for display on the screen. Normally the *cell width* is 10 spaces.

central processing unit—The main computer component. The main microprocessor, RAM, ROM, and a series of coprocessors are contained in the central processing unit (CPU). The CPU governs the operation of the disk drives, printer, and other peripherals.

character—Any letter, number, or symbol that can be displayed on the screen. Spaces and returns, when incorporated in text, may be considered *characters.*

coding—A list of steps of instructions for a computer.

command line—Refers to the group of lines at the bottom of the *Multiplan* screen that offer a list of options to pursue.

command mode—The mode one is in when one is ready to choose an option from the command line.

coordinate—The *Multiplan* work sheet is in the form of a grid; individual cells and groups of cells in the grid are referred to by their *coordinates* (R5C19).

CPU—An abbreviation for central processing unit.

CRT—An abbreviation for Cathode Ray Tube. *CRT* is another name for the monitor.

cursor—A highlighted area on the screen. The *cursor* indicates your current position on the screen. See also cell cursor.

default—In computerese, a setting that is assumed unless otherwise specified. For example, suppose someone said to you, "please give me a quarter," without specifying an American or Canadian quarter. Since you are in America, you assume an American quarter has been requested. Hence, an American quarter is the *default* setting. Likewise, when formatting cells, the *default* cell width is 10 spaces. The width remains 10 until otherwise specified.

default format—The formatting conditions unless indicated otherwise. See also *default*.

disk—A storage medium that may be used to store data, the actual *Multiplan* program, or any other information to be used by a computer. Information is stored on the *disk* in the form of magnetic particles that are arranged in concentric circles called tracks.

disk drive—The peripheral unit used to transfer information from a disk to the CPU and vice-versa.

diskette—A floppy disk with a 5¼ in. diameter. This size disk is now the most popular size available for personal computers. See also *disk* and *floppy disk*.

display—Another name for the screen.

drive—Refers to a *disk drive*, in computer jargon.

field—A collection of related data.

file—Designates an amalgamation of information that may be stored on a disk and recalled later. A *file* may be an actual computer program, like *Multiplan*, or a collection of entries such as the checking account spreadsheet.

filename—Refers to the name of the *file*. When transferring files from the disk to the computer and vice-versa, the files are referred to by their filenames. Some filenames are CHKDSK.COM, MP.COM, and FORMAT.COM.

floppy disk—There are two types of disks, hard disks and *floppy disks*. *Floppy disks* are flexible, inexpensive, and store less data than hard disks. See also *disk* and *diskette*.

format—The style of data display. For example, "dollar sign format" indicates a style where numbers will have two decimal places and a dollar sign in front of the n.

formula—A mathematical problem developed by taking cell locations and performing arithmetic functions on the cell contents.

function—A *Multiplan* tool for simplifying complicated formulas (for example, SUM (R4C5:R10C5) and AVERAGE (balance)).

hardcopy—A printout. A *hardcopy* is a listing of data or a program on paper that comes from a printer.

hardware—Tangible computer equipment such as the CPU, printer, disk drives, and keyboard. It does not include programs, data, and other *software*, which is intangible.

keyboard—The part of the computer that looks like a collection of typewriter keys. The *keyboard* is employed to send commands to the *CPU*.

left-justified—When numbers or text are displayed flush to the left-hand side of the cell. Normally numbers are *right-justified* and the text is *left-justified*.

menu—A list of choices that one may explore. The menu eliminates the need to memorize commands since all possible commands are listed on the screen.

monitor—A device used to display commands typed from the keyboard and replies from computer. The monitor resembles a television set.

net present value—A mathematical function used to evaluate investment returns. NPV takes into account the effects of inflation money. Then it enables one to compare returns from several investments in today's dollars.

printer—A unit employed to generate copies of data printed on paper.

printouts—Hardcopies generated by a printer.

RAM or Random Access Memory—The part of the computer's memory that is used by the CPU to store data on a temporary basis. This part of memory also contains programs read from disks. Retrieving data from the RAM is faster than retrieving data from the disk drive. RAM, however, is many times as expensive as disk storage.

range—A group of cells that are encompassed in a rectangle. When formatting, copying, summing, or performing other such operations and functions, a *range* of cells is specified.

relative referencing—A means of referring to cell content where one cell contains a formula to point to another cell location. Formulas containing *relative referencing* may apply to a series of similar calculations, enabling one to use the copy command. The opposite is *absolute referencing*.

right-justified—A format where the text or value of a cell is pushed to the right-hand side of the cell. It may be set with the Format alignment option.

ROM or Read Only Memory—The part of the computer's memory that has been preprogrammed and is not free to be accessed and changed by the user.

screen—The front section of the monitor which displays important information.

scroll—An action where the work sheet slowly moves across the screen. This enables one to see the entire work sheet but not in one piece. The verb "scroll" used by computer people originates from the noun. One is only able to view a small part of a scroll at one time. To see different parts of the scroll one must turn it slowly; hence, the use of the word by computer enthusiasts.

softcopy—Programs and data stored on disks. See also *software* and *hardware*.

software—Programs and data stored on disks. The information is stored in the form of microscopic magnetic particles and therefore is considered intangible. Hence, the term *software*. The antonym of *software* is hardware.

spreadsheet—A work sheet divided into columns and rows. Numbers are organized in the various columns and rows, and calculations are performed on the numbers. Spreadsheets are used in accounting, budgeting, and other business applications.

standard deviation—A mathematically calculated figure used to analyze data. There is a function in *Multiplan* that performs the complicated calculations. The *standard deviation* indicates whether the data values are all close to one value or are widely dispersed.

template—A mold from which other models (work sheets) may be formed. The *template* facilitates the construction of new models. *Multiplan* is a *template* program since it enables one to create a number of different spreadsheets with great ease.

trigonometry—A field of math dealing with the measurement of curves and angles. These measuring techniques are employed in a number of scientific calculations.

window—Because the *Multiplan* work sheet is too large to display on the screen at one time, different areas of the work sheet that are displayed are seen through *windows*. If two or more different areas are shown at the same time, they are seen through separate *windows*.

work sheet—The table displayed by *Multiplan* that one works upon. Similar to *spreadsheet*.

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